Would you like genes with that? Romanticism and the debate over genetically modified food

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The research associated with this thesis abides by the international and Australian codes on human and animal experimentation, the guidelines by the Australian Government's Office of the Gene Technology Regulator and the rulings of the Safety, Ethics and Institutional Biosafety Committees of the University."

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Abstract

For over thirty years a debate has raged over genetically modified (GM) food. While a wide range of individuals and organisations have waged a vitriolic campaign against GM food and its proponents, a number of GM crops have met with widespread adoption in the USA, Australia and elsewhere. It is surprising that after so many years, with around 70% of processed food in the USA containing GMOs, the anti-GM movement's main debating points and the level of emotion in their expression have changed little.

The aim of this thesis is to explore whether one of the factors motivating the anti-GM cause is romanticism. This worldview, and its polar opposite, classicism (or scientism), are explored through an examination of the readings in sociology, philosophy, psychology and politics on this subject. This is followed by a discussion of the influence of romanticism on the modern green movement and alternative attitudes to food, as well as its relationship with science.

While initially discussing both romanticism and classicism, the reasons for focussing on romanticism are that the views of GM proponents are fairly straightforward – GMOs are created to provide an advantage in particular agricultural food production systems, the science is sound and they make a profit, but romanticism as a worldview, though widely referenced in the arts and occasionally discussed as an influence in the environment movement, is rarely discussed in detail.

Supporters of anti-GM Facebook pages based in Australia were surveyed using an instrument designed to assess a person's relative position on the Romanticism–Classicism spectrum. The participants were found to score significantly at the romanticism end of the scale. The answers to open questions about attitudes to GM food contained emotionally charged phrases consistent with a romantic outlook. The findings are consistent with the proposition that individuals involved with the movement against GM food in Australia are influenced by a worldview based on romanticism.

Introduction

In the early hours of Thursday 14 July 2011, two women walked briskly to the perimeter fence surrounding the CSIRO[1] Ginninderra Experiment Station on the Barton Highway, 12 kilometres north-west of Canberra. Their breath formed clouds of mist as they dashed over frosty grass.

Figure 1. Photo taken by Greenpeace of them destroying a CSIRO GM wheat test crop. Picture from CBS News website. www.cbsnews.com/2100-202_162-20081362.html.

Once inside the complex they located the greenhouse where an experimental strain of genetically modified (GM) wheat was housed. After 10 years of trials and testing according to the guidelines of the Office of the Gene Technology Regulator, the research team was about to start human trials – turning their GM wheat into flour and feeding it to volunteers. The activists quickly donned white hazmat suits and started up the noisy two-stroke engines of brush cutters and destroyed the experimental crop, taking turns to photographs and video their work[2] (Gough 2011). On 19 November 2012 the two activists were given suspended sentences and Greenpeace Australia paid $280,000 in damages to CSIRO.

Though there has been a debate about genetically modified organisms since the 1980s, it has by no means settled into a stand-off. The rules, regulatory bodies, trade and market restrictions are not judged as sufficient by the anti-GM movement. For them this is an all-or-nothing battle; a crusade to eradicate GMOs.

This incident in Canberra is indicative of the highly polarised contention over genetically modified food and illustrates a number of aspects of this debate that has ebbed flowed over the last 30 years. In Australia, despite legislation being passed to control the use of genetically modified organisms and the establishment of the Office of the Gene Technology Regulator, 30 years of testing and production of GM crops, and despite the widespread use of GM seeds in Australia from cotton to canola, anti-GM activists continue to push for a complete ban. It illustrates that activists are prepared to face arrest and potential imprisonment to save the world from GM 'contamination'. It is also an example of the most common way that Greenpeace maintains itself – drawing attention to its campaigns through conducting well-planned spectacles designed to provide the media with 'colour and movement' wrapped around its campaign message, while at the same time acting as a 'moral shock' (Della Porta & Diani, 1999) rallying cry to enliven its supporters and bring in donations.

1 CSIRO: Commonwealth Scientific & Industrial Research Organisation; the Australian government's research and development body, founded in 1926.

2 This account is a composite based on a number of newspaper articles in the *Canberra Times*, the science magazine *Cosmos*, and the vivid imagination of the author.

To make my position clear it was this incident in Canberra which helped to clarify my own position on genetic modification for food production. While initially hesitant about genetic manipulation of the food we eat, I was certain that I did not support physically destroying scientific experiments unless human beings are in imminent danger from such experiments. The more I read on this topic the more convinced I became of the valuable role than genetic modification could play in world agriculture. And, at the same time, I became steadily more worried about the anti-science scare campaigns mounted on a range of fronts based on fear and misinformation.

Genetically modified food is just one of a spectrum of issues where a significant percentage of people challenge the scientific consensus[3]; some others include climate change, child vaccination, fluoridation, and the teaching of evolution. While lack of trust in institutions – government, regulatory bodies, the media, science, large corporations – is often raised as a factor inducing such oppositional views (Frewer, Howard, Hedderley, & Shepherd, 1996; Hobson-West, 2007; Malka, Krosnick, & Langer, 2009), there must be deeper causes that generate this lack of trust. My aim is to examine one possible reason for that mistrust – individuals having a worldview dominated by romanticism.

For a definition of romanticism, I will use the words of Lowy and Sayre. These scholars provide the most apt description for the purpose of this work because they are contemporary, they see romanticism as a worldview and not just as a philosophical or cultural phenomena, and their work is based on a thorough investigation of the historical, philosophical, literary, artistic and political writings on this subject:

> ... we present this worldview as a set of elements[4] articulated according to a specific logic. In other words, we construe it as a signifying structure ... underlying a very great diversity of contents and forms of expression (literary, religious, philosophical, political, and so on). Romanticism as a worldview is constituted as a specific form of criticism of modernity.... The Romantic critique is bound up with an experience of loss. The Romantic vision is characterized by the painful and melancholic conviction that in modern reality something precious has been lost, at the level of both individuals and humanity at large; certain essential human values have been alienated.... Nostalgia for a lost paradise is generally accompanied by a quest for what has been lost. An active principle at the heart of Romanticism has often been noted in various forms: anxiety, a state of perpetual becoming, interrogation, quest, struggle…. an attempt to find or to re-create the ideal past state.... One way to do this involves transforming one's immediate environment and one's own life while remaining within bourgeois society; this can take the form of ... the creation of a community of like-minded individuals, a utopian experiment ... or simply falling in love... But one may also choose to flee bourgeois

3 The following organisation have declared there are no environmental or human health issues with GM food: US National Academies of Science (Masters, 2004), the American Association for the Advancement of Science (AAAS Board of Directors, 2012), the American Medical Association ("AMA statement," 2012), the science advisor to the European Commission (Fleming, 2012), the Royal Society of Medicine (Key *et al*., 2008), the Australian Academy of Science (Higgins, 2007) and Australia's Office of the Gene Technology Regulator (Meek, 2013).

4 For a fuller explanation of the "elements" see Chapter 2.

> society, leaving cities behind for the country, trading modern countries for exotic ones. (Summarised from Chapter 1 of *Romanticism: Against the tide of Modernity)* (Lowy & Sayre, 2001)
>
> Romanticism is "opposition to capitalism in the name of pre-capitalist values" (Sayre & Lowy, 1984, p. 46)

Sayre and Lowy are contrasting romanticism's critique of capitalism with that of other anti-capitalist movements such as Marxism or anarchism which put forward alternative political and economic systems that might replace capitalism.

Romanticism has been described as playing a role in the rise of environmental awareness in the last half of the 20th century (Baker, 2007; Hunt, 2013) and as having a significant role in the arts and culture. But despite the consequent importance of this worldview there is little scholarship on its role in the modern world outside the narrow confines of the study of 19th century literature. In this thesis I will be trying to address the question: is romanticism a significant factor in the anti-GM food movement. This thesis attempts to provide a possible explanation for the underlying motivation for the debate over genetically modified food, or, more particularly, for the vehemence, longevity and intractability of this debate.

There are of course a wide range of worldviews, ideologies and professional interests which motivate people to become involved in campaigning on environmental issues. Activists can be propelled by anarchism, Marxism and even religious critiques of capitalism's impact on the biosphere. Climate scientists for example can be classicists who see science as the font of all useful knowledge and are frustrated when their work on climate change is ignored. However, it is my contention that the anti-GM movement in particular is dominated by methods and content that is inspired by romanticism.

Viewing romanticism and classicism as polar opposites can be a useful schema to discuss certain issues (like the GM debate). However, this is not to say that a complex and hard to pin down collection of traits and ideologies such as romanticism can be wholly encompassed by the schema of it being a binary opposite to classicism.

Many scholars see romanticism and classicism as opposites while many others do not. To a large extent this is a false argument. Some of the key aspects of these two worldviews are set out in Chapter 2. Many of the characteristics can be seen as polar opposites; for example, romanticism views science sceptically, preferring direct experience and feeling, while classicism is associated with a strong belief in rationality and science. Seeing these two worldviews as polar opposites can be a useful schema to discuss certain issues (like the GM debate). However, this is not to say that a complex and hard to pin down collection of traits and ideologies such as romanticism can be wholly encompassed by the schema of it being one pole of a pair of binary opposites.

* * *

The manufacture and distribution of food is obviously of vital interest to humanity. The international seed industry is worth billions annually[5]. The controversy over GM food has continued unabated since the 1980s and the two sides have not changed their key debating points. What motivates the pro-GM end of the spectrum is fairly clear: scientists are confident in their findings as to the efficacy and safety of GM crops; farmers can see higher yields and/or reduced production costs; and the corporations involved in supplying farmers GM seed and selling GM food are able to make a profit. Given the widespread use of GM seed by farmers, the prevalence of GMOs in retail food products and the scientific consensus, is the anti-GM movement a case of "motivated reasoning" (Kunda, 1990)? According to Lewandowsky *et al*: "Motivated reasoning refers to the discounting of information or evidence that challenges one's prior beliefs accompanied by uncritical acceptance of anything that is attitude-consonant" (Lewandowsky, Gignac, & Oberauer, 2013, pp. 8–9). Lewandowsky *et al* use the following example: when a clear scientific consensus on the effectiveness of vaccination in eliminating serious childhood diseases is denied, and no amount of information backed up by research will change that viewpoint, this is motivated reasoning (Lewandowsky *et al*., 2013).

Motivated reasoning

Such motivated reasoning is common on political and scientific issues, especially if an individual has little incentive to exert effort to look into all the arguments (Bolsen & Druckman, 2015). In Western countries, where consumers have a vast array of food choices, no one is going to 'lose any skin' by choosing organic over GM. Therefore, it is reasonable to hypothesise that with little to lose by opposing the GM industry, those with a romantic bent, who are perhaps supportive of organic farming, suspicious of big business and critical of pro-industrial science that intrudes on an idealised view of nature, are likely to reject GM food.

However, human beings don't act purely on the basis of their worldview. There are a multitude of factors which influence what we think and what we do – social class, peer pressure, ethnicity, financial gain, emotional consequences, etc. Worldview contributes to decision making by acting as a filter; as "orienting mechanisms, helping people navigate in a complex, uncertain, and sometimes dangerous world" (Peters & Slovic, 1996, p. 1427).

But for those strongly influenced by a particular worldview, the impact of it on emotion-laden issues can be to eliminate shades of grey. There is considerable scholarship examining global civil society activism and its use of romanticised moralising messages (Della Porta & Diani, 1999; Brooks, 2004; Bob, 2005; DeMars, 2005; Jasper, 2010). Much of this commentary centres on the utopian tone of movement rhetoric, reducing complex issues to black and white. Brunkhorst is of the view that: "All cultural protest movements whose critique of the Enlightenment's … [characteristics of] … instrumentalism, objectivism, and reification … are romantic" (Brunkhorst, 1986, p. 409).

As one example of how this applies to the GM food debate, the website of the US Organic Consumers Association features an article titled: *Seeds of Evil: Monsanto and Genetic*

5 In 2011 the international seed trade was worth US$42 billion (http://www.worldseed.org/isf/seed_statistics.html).

Engineering[6]. The tone of this article borders on hysteria as it seeks to link an unexplained skin complaint, Morgellons disease, with GMOs. As Bownas states: "Manichean renderings of good *versus* evil, science *versus* nature, innocent *versus* guilty" are common romanticised themes in anti-GM literature. (Bownas, 2012, p. 14).

Science reaction

The reaction to this kind of criticism by many proponents of GM technology is to label critics as 'anti-science' (see Table 3). But this generalisation belies a more complex relationship between science and many in the anti-GM camp. For example, the US-based OrganicConsumer.org website carries a range of articles supporting climate change science and non-GM agricultural research, as well as anti-GM information. [There is an expanded discussion of the relationship between science and romanticism in Chapter 2.] But many scientists and science writers see rejection of GM technology in a more black and white way and ask the question: 'Why do environmentalists support climate science but deny GM science' (Tribe & Roush, 2013; Lewandowsky, 2013; Walsh, 2013). The simple answer is that many people, including anti-GM activists, do not lump all scientific research together in an undifferentiated whole and give it a blank cheque; each piece of research is evaluated according to their values.

GM scientists have reacted forcefully to anti-GM research results (Waltz, 2009; Charles, 2011; Paterlini, 2013) to the point where they have been accused of bullying tactics (J. Smith, 2013). In the heated atmosphere of this debate such behaviour is not unexpected. As with the development of new pharmaceuticals, it can take many years, even decades, to take a particular GM project from an idea to a commercial seed line. It could only be expected that GM scientists and the seed industry would react vigorously to attacks on their research outputs and the resulting technology and products, especially if they have passed scrutiny by government regulatory bodies.

Brian Wynne at Lancaster University has published for 30 years on the "supra-human autonomy of Science" (Wynne, 2014, p. 61). Science wishes to see itself as a value-free means of testing and creating knowledge that should be the sole and final means to determine an issue. The fundamental problem is that science to a large degree sees itself as having natural sovereignty over public meaning (Cameron & Edge, 1982). But the anti-GM food movement raises wider objections than just to the science of genetic modification. Corporate control of the international seed industry (Lyons & Scrinis, 2010; Wallace, 2010; Roseboro, 2013) and the role of Monsanto and its previous activities are all called into question[7]. This is essentially an anti-capitalist movement – it questions the direction and priorities of research and the corporatisation of farming and food production. What movement rhetoric does not do is make this anti-capitalism explicit or link it directly to GM technology.

6 https://www.organicconsumers.org/news/seeds-evil-monsanto-and-genetic-engineering

7 Three of the anti-GM activist sites that talk about Monsanto's production of Agent Orange during the Vietnam War: http://www.march-against-monsanto.com/agent-orange/ https://www.organicconsumers.org/old_articles/monsanto/agentorange032102.php http://www.infowars.com/chilling-how-monsantos-agent-orange-is-still-used-today/

So what chance does the ordinary citizen have of deciding an issue for themselves or to take issue with prevailing scientific opinion? John Dewey (Dewey, 1988) and Bruno Latour (Latour, 1993), amongst others, point out the asymmetry between science and everyday life, between scientific knowledge and common knowledge. Many scientists seek to add a qualitative difference to this asymmetry: "They create terms such as 'knowledge' (*episteme*) *versus* 'belief' (*doxa*), 'scientific' *versus* 'common sense', and even 'rational' *versus* 'irrational' (Biesta, 2007, p. 477).

What is it about romanticism that generates this emotional and heated opposition to GM food? As used in this thesis, romanticism refers to a worldview that sees reality as spiritual, that emphasises the centrality of Nature, sees self-expression as essential to humanity and longs for a simpler pre-capitalist era (Schmitt, 1919; Lovejoy, 1941; A. W. Gouldner, 1973; Hochuli, 2008). It is difficult to pin down romanticism in a single brief definition. [For more on this topic see the section *Characteristics of romanticism* in Chapter 2.]

Scientism

In opposition to romanticism stands scientism. Scientism (or classicism) refers to a worldview that claims that all aspects of the universe can be known through science and that therefore science is the only means to establish knowledge (Elzinga, 1984). It is useful to define scientism in contrast to a healthy and useful application of scientific method. Science, according to the American Association for the Advancement of Science, is "an activity that seeks to explore the natural world using well-established, clearly delineated methods" (Burnett, 2015, p. 1). Given the complexity of the universe, a large and growing number of scientific disciplines operate with their own specific techniques. Scientism, on the other hand, is a speculative worldview that:

> … broadly generalizes entire fields of academic expertise and dismisses many of them as inferior… [T]o claim there is nothing knowable outside the scope of science would be similar to a successful fisherman saying that whatever he can't catch in his nets does not exist. Once you accept that science is the only source of human knowledge, you have adopted a philosophical position (scientism) that cannot be verified, or falsified, by science itself. It is, in a word, unscientific.
> (Burnett, 2015).

The importance of this definition of scientism is that it shows the equivalent blind faith that both worldviews may provide. If romanticism and classicism dominate the poles of the GM debate the result is two sides that may believe with religious fervour in the correctness and certainty of their positions.

Challenges to the scientific consensus

So, in the second decade of this millennium how is science as a whole viewed by the public, especially in relation to controversial issues? From the middle of the 20th century, there has been a simmering debate between some involved in the sciences and some social scientists over the sociology of knowledge. By the 1990s this controversy had burst into open warfare and was labelled the 'Science Wars', partly as a surrogate for the wider dispute between postmodernism and positivism (Ross, 1996; Schick, 2000; Fuller, 2013). This thesis does touch upon the

validity of scientific knowledge so it is useful to briefly describe this debate as background to current contentious science issues.

While recognising the highly contested nature of these terms, Brown provides some useful simple definitions as a starting point to understanding the science wars. "To say that knowledge is a *social construction* is to say that it is the product of various social factors and not the result of an objective investigation into how things are, independent of our social interests. But there is more to it than just belief – there are no objective facts of the matter to be discovered, according to constructivists" (emphasis added; Brown, 2001, pp. 3–4). However, there need not be an absolute distinction between objects and belief. As an example, "one could – with considerable plausibility – claim that quantum mechanics, for example, is objective knowledge, whereas economics is largely a social construction" (Brown, 2001, p. 4).

Relativism, related to social construction and which can be seen to result from it, says that all knowledge is constructed by a particular group, society or culture. Polygamy may be outlawed and morally wrong in our society but permissible in other cultures. The big bang theory may work for us as an explanation of the origins of the universe but another society may have a different and equally valid one (Brown, 2001).

C. P. Snow's book *Two Cultures* in 1959 attempted to divide the world into scientific and literary tribes (Snow, 1959). In 1994 the publishing of *Higher Superstition* (Gross & Levitt, 1994) marked a raising of the temperature of the Science Wars[8]. This book was a defence of science against what the author's saw as the rising tide of postmodern relativism. It was a politically conservative and shrill attack on "multiculturalism, feminism, 'the postmodern academy,' and indeed, democracy" (Athanasiou, 1995, p. 17). Mercer summarises the theme of *Higher Superstition* as: "Failure to accept the existence of a universal rational scientific method that leads directly to technological and social progress is interpreted as displaying a hostile anti-science attitude" (Mercer, 1999, p. 78).

Over the last 40 years or so a variety of constructivist views of epistemology have been developed by Ludwik Fleck, Thomas Kuhn, Michel Foucault, David Bloor, Paul Feyerabend, Thomas Kuhn and Bruno Latour (Fromm, 2006). While their specific ideas about science, truth and epistemology vary, collectively they wished to challenge the enlightenment idea that science and only science equals truth. While post-Karl Popper[9] philosophers of science have been willing to acknowledge that the *production* of scientific ideas is affected by context and idiosyncratic biases, the transformation to knowledge has largely been seen as pure and

8 For background on this term see a history of the dispute by Prof Harry Collins at Cardiff University: http://www.cardiff.ac.uk/socsi/contactsandpeople/harrycollins/science-wars.html

9 Sir Karl Raimund Popper (1902–1994) was an Austrian-British philosopher. He is generally regarded as one of the greatest philosophers of science of the 20th century. He is known for his rejection of the classical inductivist views on scientific method, in favour of empirical falsification: A theory in the empirical sciences can never be proven, but it can be falsified, meaning that it can and should be scrutinised by decisive experiments. If the outcome of an experiment contradicts the theory, one should refrain from ad hoc manoeuvres that evade the contradiction merely by making it less falsifiable. Popper is also known for his opposition to the classical justificationist account of knowledge which he replaced with critical rationalism, the first non-justificational philosophy of criticism in the history of philosophy.

empirical (Shapin, 1998). The work of Bruno Latour has had a major impact through developing the discipline of science and technology studies (STS). STS scholars like Latour argue that scientific knowledge is socially constructed. Latour puts forward the almost common sense view that scientists work within a given culture, with their own set of values and practices (Latour, 1983; Latour, 1987; Latour, 2011b). But in many of his writings he pulls back from the precipice of total relativism and distinguishes between "matters of fact" and "matter of concern" (Latour, 2004).

Modern popular debates over scientific controversies – GM, climate science, 'intelligent design, child vaccination – are fought in the various terrains of social media, websites, political activism and movie star endorsements. What these modern debates have in common with the science wars is a challenge to scientific orthodoxy. Discussing the views of climate sceptics Latour states: "As I have shown many times elsewhere, the divide is not between science and politics but between trusted and not trusted representatives" (Latour, 2011b, p. 72).

In 1975 the prominent American philosopher, Jacob Needleman, wrote: "Once the hope of mankind, modern science has now become the object of such mistrust and disappointment that it will probably never again speak with its old authority, (Needleman, 1975, p. 1). In a similar way to Ulrich Beck's risk society thesis (Beck, 1999) he lists some of the reasons for this decline in trust as numerous environmental problems, the threat of nuclear annihilation during the Cold War and the general dislocation to patterns of life caused by rapid technological change. Anthony Giddens suggested that postmodern characteristics of disillusionment and suspicion towards science have contributed to decreased trust in 'expert systems' (Giddens, 2009).

The issues of child vaccination, climate change and GM food have much in common, with active movements challenging both the scientific consensus on these issues and the actions by governments resulting from that consensus. These three issues generate emotional and vehement opposition from articulate and organised groups. And while each of these debates has continued for quite some time it appears unlikely that more or new information is likely to resolve anything. These oppositional viewpoints are not caused by a lack of scientific knowledge; in fact, more facts and science are likely to further cement entrenched views (Kahan, 2010).

The vast majority of those opposing the scientific consensus on any of these issues are not doing so purely on the grounds of critiquing that science. The common denominator is trust – trust in political institutions, in big business, the media and in capitalism generally. Interest in politics and environmental issues is linked to trust in institutions (Clements, 2012).

Decline of trust in authority in Western Countries since the 1960s is the result of a range of sweeping social changes including rising social inequality (Uslaner, 2002; Dalton, 2005), the rise of social movements in the 1960s (Dalton, 2005), the failure of expert systems to manage risk (Alario & Freudenburg, 2003; Beck, 2006) and some specific to the USA ("disillusionment with US involvement in the conflict in Vietnam … Watergate ... the Iran-contra scandal" etc.) (Chanley, 2009).

Whatever the causes, in an age when we have never been so reliant on science and technology, the gap between the views of the producers of 'facts and machines' (Latour, 1987b) and the consumers of them seems to be widening. In 2014 the Pew Research Center in Washington DC

teamed with the American Association for the Advancement of Science to contrast public opinion with that of AAAS members on a range of issues. The results reveal enormous disparity between the two groups. Interestingly, the largest difference in the survey between the views of scientists and the public was on the safety of genetically modified food:

> The largest differences between the public and the AAAS scientists are found in beliefs about the safety of eating genetically modified (GM) foods. Nearly nine-in-ten (88%) scientists say it is generally safe to eat GM foods compared with 37% of the general public, a difference of 51 percentage points. One possible reason for the gap: when it comes to GM crops, two-thirds of the public (67%) say scientists do not have a clear understanding about the health effects.

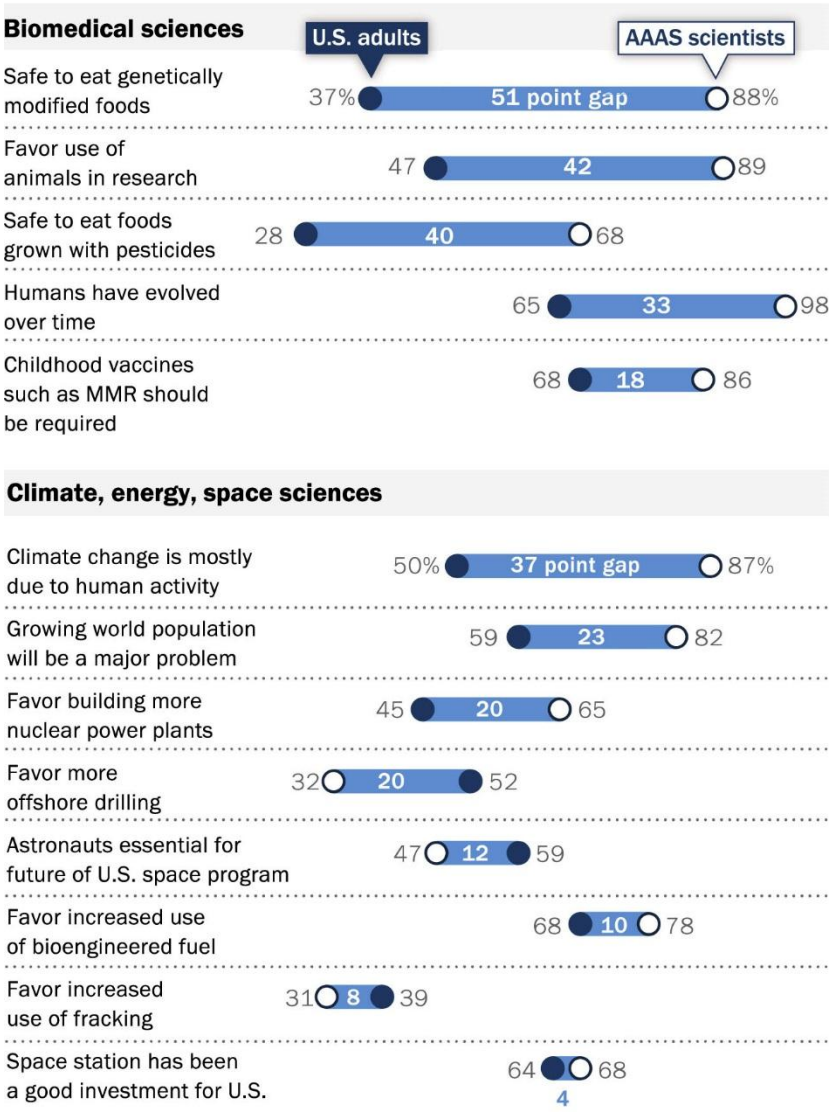
That 51 point gap is one of the motivations for this thesis. Looking at the results in Table 2, the other concerns covered in this survey are not trivial questions. Does humanity need to urgently change its behaviour to avert catastrophic climate change? Is a world population of 9.3 billion people in 2050 (UN, 2010) something to worry about and how do we feed them? Can we really have informed debate on these life and death issues with people who think that the world is only tens of thousands of years old and humans were put here fully formed by a supreme being? Humanity needs to answer these questions and so it is important to understand the basis of these fixed positions in order to facilitate dialogue.

Table 1. Pew Research Center/AAAS survey question on attitudes to GM food

% of each group saying it is generally safe or unsafe to eat genetically modified foods			*% of U.S. adults saying that scientists have or do not have a clear understanding about the health effects of GM crops*		
	Generally unsafe	**Generally safe**		**Scientists not clear**	**Scientists clear understanding**
US adults	57	37	US adults	67	28
AAAS scientists	11	88			

(A. Smith, 2015, p. 8)

Table 2. Pew Research Center/AAAS survey of views about science and technology issues



Survey of U.S. adults August 15-25, 2014. AAAS scientists survey Sept. 11-Oct. 13, 2014. Other responses and those saying don't know or giving no answer are not shown (A. Smith, 2015, p. 6).

'Impact science' and 'production science'

It is useful at this point to make explicit what kind of science we are talking about. As far back as the late 1970s, some social researchers distinguished between scientific research aimed at boosting production ("production science"), from research that hopes to improve our understanding of the impacts of the modern industrial economy on the environment and human health – "impact science" (Schnaiberg, 1977). Using this schema science can be differentiated by its intended outcomes. "This 'impact science' has challenged the assumption that production science inevitably leads to advancement and progress for society" (McCright, Dentzman, Charters, & Dietz, 2013). In short, do the risks outweigh the benefits?

Climate change science, pointing the finger at human post-industrial revolution activity, is fully in accord with a worldview that values nature, is highly sceptical of capitalism and modernity,

and that has an interest in, and a respect for, life sciences and "impact science." This also parallels Bruno Latour's suggestion, quoted above, that the key factor is not for or against science *per se* but who you *trust* to provide information about science, technology, health and the environment. In this case, especially, what institutions do you trust – corporations, government, scientists working for governments or corporations, etc.

As explained more fully below, the most significant characteristic of romanticism from the mid-nineteenth century to today is its "opposition to capitalism in the name of pre-capitalist values" (Sayre & Lowy, 1984, p. 46). Romanticism is a critique of modernity, not aiming towards a utopian future, but rather generates a longing for an idyllic, mythical nature-centred past. While environmental groups rail against the science of genetic modification (production science) much of their focus is on its implementation – "Monsatan", the idea that GM crops increase monocrop farming, increasing corporate control of the food system, etc. Many anti-GM critics suggest that small-scale mixed farming using organic methods is the only answer for sustainable food production (Pollan, 2008; Dorozenski, 2015).

Romantics are overwhelmingly supportive of the impact science critique of capitalism provided by climate change research. Four groups (though not mutually exclusive) largely opposed to climate science are political conservatives, a small number of contrarian scientists, libertarians and right-wing conspiracy theorists[10]. Between 1997 and 2008 the gap between what Democrat voters and Republican voters in the USA thought about climate change jumped from a 4 percent difference to a 34 % difference (Maibach, Roser-Renouf, & Leiserowitz, 2009). Over that time fossil fuel companies and right-wing think tanks worked to label climate change as a liberal issue. It was reframed so as to trigger the human predisposition to adopt and stick with views that are in line with the groups with which one identifies (Kahan, 2010; Hamilton, 2010).

Romanticism's attitude to "production science" – the science underpinning technology and capitalist expansion – is often antagonistic. For example, the original *Frankenstein* novella, its countless versions as a book, play and movie, as well as the thousands of imitators over the last 150 years, are an illustration of the deep suspicion of those who embrace romanticism towards the onward march of the "dark, satanic mills" (Blake, 1804) – the factories, mines and railroads. 20th and 21st century fiction overflow with romanticism, as doomsday scenarios unfold about the over-reaching of evil or naïve scientists whose work threatens human existence.

10 Rupert Read explains that: "Far too often, 'libertarianism' nowadays involves a fantasy of atomism; and an unhealthy dogmatic contrarianism.... Libertarians have various strong motivations for not wanting to believe in the ecological limits to growth: such limits often recommend state-action/undermine the profitability of some out-of-date businesses (e.g. coal and fracking companies) that fund some libertarian-leaning think-tank work." (Read, 2014)

Large multinationals (e.g. oil companies) and notably the Koch brothers in the USA commonly fund right-wing think tanks to cause obfuscation on issues around climate change. "Contrarian scientists, fossil fuels corporations, conservative think tanks, and various front groups have assaulted mainstream climate science and ·scientists for over two decades (Jacques, Dunlap, & Freeman, 2008)

A clear link has been established by Stephan Lewandowsky between conspiracist ideation and the rejection of scientific propositions such as anthropomorphic climate change (Lewandowsky, 2015).

Before going further, I should outline my position in this debate. While I have worked as a science communicator and for an agricultural research organisation, I am not blind to the shortcomings of seeing science as the only source of human knowledge. Science doesn't make moral judgements. You can't use it to make aesthetic judgements either. And new scientific breakthroughs don't help us decide how to apply them. Seeing science as the only source of knowledge and providing the answers to all problems effecting the human race (scientism) is a false and distorting way to view the world.

Romanticism has made enormous contributions to the arts, philosophy, psychology and other fields. What's at issue here is: has the influence of the romantic worldview in the environment movement contributed to a misinformed debate of genetically modified food? Does the emotion-laden certainty of the "unnaturalness" of GM contribute to false or exaggerated claims of potential health and environmental impacts?

In summary, it is not surprising that some people at some time do not accept what the majority of scientists assert about a particular issue. There are any number of reasons why someone might have a contrary view. But the kind of rhetoric used (allegations of conspiracy by companies, governments and/or the media; 'it is not natural'; unreserved belief in outlier pseudoscience, magical thinking) and the highly emotional tone of such campaigns strongly point towards romanticism as a key motivation for such opposition.

Thesis outline

This thesis adopts an interdisciplinary social science perspective, drawing on work from sociology, philosophy, psychology and history to throw light on this issue. The next chapter summarises why there is a need to increase world food production and how genetic modification fits into that endeavour. The Green Revolution of the 1960s is described, with a focus on its impact in India and romantic opposition to it and GM food. I provide a sketch of the history of opposition to GM food and indicate how the language and level of emotion used by the movement correspond to romanticism.

Chapter 2 provides a historical perspective on romanticism and situates it as a prevalent worldview that has had a major impact in the last 200 years on the arts, politics, philosophy, environmentalism and social movements. Both the enlightenment and the 19th century rise of romanticism are described and contrasted. The key characteristics of romanticism and classicism are examined. There is a focus on the relationship between romanticism and science, food and nature as well as its role in the politics and culture of the modern era.

The Approach and Methods chapter sets out the focus of my research. The most interesting and complex aspect of this topic is to grasp the nature of romanticism and its specific manifestations in the anti-GM movement. I applied a survey instrument designed to measure respondent's degree of romanticism–classicism to supporters of anti-GM Facebook pages based in Australia. In addition, I provided some open questions for respondents to describe their key areas of complaint about genetically modification of food.

The following chapter then examines the results of the application of the Romanticism–Classicism Index. The scores are discussed and some of the more interesting results for specific questions are highlighted. The participants scored significantly at the romanticism end of the

spectrum. This is followed by an analysis of answers to the open questions where respondents' main concerns about GM food are discussed.

The conclusion then attempts to pull together the disparate areas of scholarship on romanticism and anti-GM activism, as well as my research data, into a theory of the underlying ideological basis for this protracted debate, as well as including suggestions for future research.

The literature review section of this thesis may be seen as somewhat longer than is generally the rule. The reason for that is the nature of the task. What I am trying to assert is that romanticism is much more than a historical period in which people created romantic poetry, art and music. What I need to establish from a relatively small pool of scholarship, some historical and some contemporary, is that romanticism is a worldview possessed by some human beings in previous centuries and in the 21st as well, that people with that worldview exhibit it in a broad wide range of human activity, and that examples are in attitudes in the West to science, nature and food, in particular the anti-GM food movement.

Chapter 1:
The movement against genetically modified (GM) food

This chapter examines the conjoined histories of the development and deployment of genetically modified crops on the one hand, and the rise and spread of the anti-GM movement on the other. The story begins with a sketch of the history of plant breeding. Whether GM technology is a continuation or a break with traditional plant breeding is one of the often debated aspects of the GM food controversy. I then look at the Green Revolution of the 1960s when changes in farming technology averted worldwide famine. The impact of the Green Revolution and GM products in India are examined, followed by the unfolding of the international anti-GM movement.

What is genetic engineering or modification?

There is nothing very complex about the *idea* of genetic modification. If you want a particular characteristic in an organism, you work out what gene or genes determine that trait and insert those genes into your target crop variety. It may be as simple as turning a gene off to achieve the desired result. For example, CSIRO Plant Industry are working on a variety of wheat where two genes are 'turned off' resulting in white flour that is low GI (Morrell, 2011). There are a couple of basic concepts about DNA and genetic engineering that are relevant to some of the arguments used in the GM food debate. DNA (deoxyribonucleic acid) is the recipe for life. The size, shape and functioning of all organisms are determined by their genetic structure. DNA is a universal language: the same four sub-units of DNA (represented by A, T, G and C) make up the genetic code of all living things (Higley, 2012).

Traditional breeding produces an organism whose DNA is derived half each from its two parent organisms. The aim of genetic engineering is to select particular beneficial traits and insert them into the target organism. The resulting GM organism is then reproduced for several generations to ensure that the genes are passed on correctly and provide the desired benefits reliably (Thomson, 2006). There has been a very rapid expansion in the knowledge about genetics in the short time since the 1953 discovery of DNA. Scientists can now determine the complete genetic sequence of a particular human being, animal or plant in a few days (Chowdhury, 2009). But there haven't been any changes to the *fundamentals* of what happens in genetic laboratories over the last 20 years, rather predominantly a speeding up and refinement of the techniques (Borlaug, 2000; Roco, 2004; Cressey, 2013).

Traditional plant breeding

One factor in contention in the anti-GM movement is the extent to which genetic modification technology is a continuation of, or a break from, the history of plant breeding. Prior to about 10,000 BC, archaeological and anthropological evidence suggest that human tribes survived primarily by hunting and gathering from the natural environment (Kingsbury, 2009). Domesticating animals and planting crops provided a more stable food supply and allowed for the accumulation of reserves for future use and trade. Over time farmers learned to selectively breed from varieties that had beneficial traits such as larger fruit or quicker ripening. Herders likewise selected animals for specific beneficial qualities to breed from. Throughout this time

human beings transformed natural environments into agricultural landscapes through the application of innovation and technology.

Plant and animal breeding techniques, along with modest improvements in farming methods and equipment, served the human race well until the 1950s when population pressure began to outstrip food production creating widespread famine, especially in times of drought (Perkins, 1982; McIntyre, Herren, Wakhungu, & Watson, 2008). By the end of the 1950s the world faced the prospect of prolonged and widespread starvation. The fledgling United Nations threw itself headlong into programs to improve agricultural production in developing nations, partly to combat hunger and partly to slow the movement of people to slums on the outskirts of cities that could not cope (McIntyre *et al*., 2008). While there were genuinely altruistic reasons for the USA's participation in the program, the Rockefeller Foundation and US government agencies were also involved as the prevention of starvation was seen as a useful means to counter the expansion of Communism (Perkins, 1982).

Green revolution

According to Khush, it took agriculture 10,000 years to produce one billion tons of food grain in one year (in 1960). It took just 40 years to achieve two billion tons. The Green Revolution of the 1960s greatly expanded agricultural production (Khush, 2001). Continuously from the 1960s to the beginning of this century, the development of around 2,000 new high-yield varieties of 11 key grain crops (especially rice, wheat and corn) (Evenson & Gollin, 2003), together with the application of synthetic nitrogen fertiliser and other improved technologies and farming techniques, resulted in a massive increase in food production. Unfortunately, while world food production continues to expand, the increase in world population is also proceeding at an alarming pace. According to the United Nations the current rate of world population growth is 1.3% per year, which is where it has been for over 20 years (UN, 2010). This means world production of grain needs to increase by around 26 million tons each year to feed this growing population (Khush, 2001).

Most of the improved plant varieties that powered the Green Revolution were produced by two large public institutions: the International Center for Wheat and Maize Improvement in Mexico, and the International Rice Research Institute in the Philippines (IRRI) (Khush, 2001; Evenson & Gollin, 2003). But from the 1980s there was increasing privatisation of markets (the abandoning of state controls over food markets) and rising levels of private research into improved crop varieties and the associated sale of seed (Swinnen & Maertens, 2007). Until that time there had been a considerable degree of cooperation between private sector seed companies and public sector research institutes. The break between the public and private sectors occurred with the move to genetic engineering as the private sector focussed on GM. By 1998 the nine largest agribusiness companies were investing $2.6B annually in research (Pingali, 2003).

But the massive shift in production techniques and accompanying social dislocation that accompanied the Green Revolution was not met with universal approval. Prominent Indian anti-GM campaigner, Vandana Shiva, wrote a book about what she perceived as the adverse impact of the Green Revolution on India called *The Violence of the Green Revolution* (Shiva, 1993b). Her claims that rural life in India was being destroyed and peasant farmers dying are derided by many other Indian observers of this period (Gupta, 2004; Purushottam, 2006; Singh, 2015).

Shiva's romantic attachment to an ahistorical, idealised view of village life blinds her to the abject poverty, living on the edge of starvation, that was to a considerable degree alleviated with the use of modern farming methods, hybrid varieties and engagement in commercial markets. Shiva is credited with invention of the term "culturally-perceived poverty" (Shiva, 1988, p. 8). For Shiva "real material poverty" is deprivation, people who are starving, that the commercialisation of the economy produces through "poverty and dispossession" (Shiva, 1988, p. 1). She contrasts this absolute poverty with "prudent subsistence living" which satisfies "basic needs through self-provisioning…" (Shiva, 1988, pp. 8–9).

Shiva creates a virtual gothic novel, stringing together historical references to India's past with the David and Goliath battle of Indian peasants taking on neo-colonial free trade in order to preserve their "prudent" subsistence way of life:

> The seed signifies the freedom of diverse cultures from centralized control. In the seed, ecological issues combine with social justice. The seed can play the role of Gandhi's spinning wheel[11] in this period of recolonization through "free-trade". The native seed has become a system of resistance against monocultures and monopoly rights... Diversity as a way of thought and a way of life is what is required to transcend the impoverished monocultures of the mind.
> (Shiva, 2005, p. 52)

Here, Shiva sets up a battle between Indian peasants, following the noble path of Gandhi, against the rapacious greed of the neo-colonial powers. The notion of 'monoculture' as a negative feature of commercial farming (allegedly fostered by GM crops) is explored further in Chapter 4. This deeply-conservative agenda supports subsistence farming that cannot even meet basic nutritional needs (Cochrane, 2007) let alone provide the means to send children to school or provide basic health care. Romanticism in this Indian context doesn't juxtapose organic vegetables and farmers' markets to "corporate" agriculture, it offers instead a dirt floor, no running water and perhaps enough food to exist, but not to thrive.[12]

In the words of Tom Brass such populist romantic views of subsistence farming exhibit:

> … nostalgia for a vanishing way-of-life, linked in turn to perceptions of an idyllic/harmonious/folkloric village existence as an unchanging/unchangeable 'natural' community and thus the repository of a similarly immutable national identity. Linked to the latter was the view of the countryside generally as the locus of myths/legends, spiritual/sacred attributes, non-commercial values, and traditional virtue.
> (Brass, 2000, p. 11)

11 The charkha, or spinning wheel, was the symbol of Gandhi's program, representing self-sufficiency and interdependence. This symbol is at the centre of Indian historical and political myth-making and adorns their national flag. [The Metta Center for Non-Violence, mettacenter.org.] Ironically, it is based on a Buddhist symbol from 200 BC that symbolises there is life in movement and death in stagnation. [All about India website, http://www.all-about-india.com/Flag-of-India.html)

12 The National Rural Employment Guarantee Scheme (NREGS) in India which targets extreme poverty measures food security, financial inclusion and health outcomes. While evaluations of this program judge it to be effective, there is no shortage of extremely poor and undernourished people amongst subsistence farmers in India (Ravi & Engler, 2015).

This quote from Brass is not specifically about Vandana Shiva's work but part of a much more general discussion about populist agrarian myths. This helps to position Shiva's thesis not as part of postmodern anti-colonial feminism, but rather as part of a long line of populist romantic agrarian myth-making that rejects modernism in favour of a simple (poor) rural existence.

To return to the green revolution, Indian agricultural scientist M. S. Swaminathan extols the virtues of integrated pest management, integrated nutrient supply and scientific water management that were the results of applying modern agricultural techniques in India (Brand, 2009, p. 191). During the 1970s large-scale popular movements formed in India calling on the government to provide more infrastructure to further the development of commercial agriculture. The introduction of cash crops and modern farming methods allowed some subsistence farmers to become farm workers earning an income and "saw their children begin to move to the cities, not for manual labor, but into white collar jobs" (Bownas, 2012, p. 230). There were of course winners and losers in India during this massive transformation. However, the overall impact on the rate of poverty in India was a dramatic and long-lasting improvement (FAO, 2006). But, as in many other countries, population accelerated at an exponential rate as the increase in agricultural production only grew arithmetically. The search was on for ways to continue significant growth in agricultural production that was also sustainable and good for the environment.

Framing the debate

From the beginning the anti-GM food movement had two broad categories of concerns. The first was around the application of this novel technology: potential dangers to human health and the environment, as well as other social issues. Schurman and Munro see this as a particularly, striking example: the "social, moral and ethical issues raised by intervening in nature with such a powerful set of tools" (Schurman & Munro, 2010, p. 57). These are indeed a powerful set of tools, both technically and sociologically. The second related to a critique of capitalism: US 'food imperialism' (Engdahl, 2004), control of the international seed trade and that GM crops would lead to a domination of food production by a few large seed companies led by Monsanto. These two central themes in anti-GM movement rhetoric have continued to the present day and will be explored further in the survey analysis in Chapter 4.

The nature of much of the rhetoric from the anti-GM movement around these two areas reveals the influence of romanticism. In the early days of GM food, it is understandable that some people may have been concerned about its potential impact when the technology of gene transfer was in its infancy and the resulting food products were new in the market. But today, despite a widespread scientific consensus on the safety of GM food, despite trillions of meals of GM food eaten (Eenennaam & Young, 2014), and evidence of no other health or environmental problems (Freedman, 2013), the high level of emotional accusations about GM food remain. This indicates that the sentiment of many in the anti-GM movement are potentially caused not by a desire for a sober assessment of the facts but rather an emotional reaction based on their worldview (Borlaug, 2000; Cormick, 2013; Stephan Lewandowsky, 2013).

In 1976 a citizen's review board was set up in Cambridge, Massachusetts USA to decide whether DNA research could have adverse health impacts. Around the same time a US presidential taskforce suggested a Science Court that could arrange debates between scientists

with differing views on controversial scientific and technical issues. While having similar roles, the assumptions behind these two bodies illustrate very different points of view about who should make decisions about controversial technology. Advocates of the Science Court thought this was a role exclusively for scientists – "scientists who can distinguish facts from values in controversial areas will help to resolve disputes" (Nelkin, 1978, p. 191). By contrast, supporters of the Cambridge Review Board saw an inextricable link between factual disagreement and values and were very definite that decisions on such research "must not be adjudicated within the inner circles of the scientific establishment" (Sullivan, 1976). Scientists have always resisted public control over what they do but this issue has been at the heart of the GM food debate. It was the clear intention of Cambridge City Councillors, via the Experimentation Review Board, was to impose democratic controls or limits over the direction of scientific research in their area (Waddell, 1989).

The conflict over genetically modified food arose in the context of the different choices made in the USA and Europe in mid-1980s over how to regulate the GM food products emerging at that time; whether to assess the risk of GM according to the *products* themselves or according to the underlying *process* of manufacture (Winickoff, Jasanoff, Busch, Grove-White, & Wynne, 2005). In the USA, it was agreed between proponents and the regulators that GM products that were substantially the same as their non-GM counterparts would be regulated in the same way as any other food product (Acosta & Chaparro, 2008; Barrows, Sexton, & Zilberman, 2014). Stricter rules were applied where the GM product was not substantially equivalent (Gruère, 2007; Lau, 2015). By contrast, the European approach, to judge GM foods by the process by which they were made, meant that all GM products were viewed as having potentially novel risks for human health and the environment (European Commission, 2010).

From the start the anti-GM food movement was an international one, matching the international nature of the GM food industry. Global organisations like Greenpeace and Friends of the Earth, took up the fight along with a gradually increasing number of smaller organisations, ad hoc groups and individuals, using the Internet to exchange information and to organise.

The widespread promotion of GM crops coincided with the aftermath of several serious food scares in Europe that heightened awareness of the general need for food regulation. In the wake of the BSE ('mad cow') beef contamination scare in Europe in the late 1980s (Schurman, 2004), the anti-GM movement attempted to mobilise people around the pollution caused by 'Frankenfoods' and stressed the hazardous potential that biotechnology posed to the human body, accusing the industry of trying to force-feed people unsafe and untested GM food (Levidow, 1999; Specter, 2000; Schweiger, 2001).

The term 'Frankenfood' was coined by US English Professor, Paul Lewis (Lewis, 1992), in a 1992 letter to the *New York Times*. The creation of this term early in the debate help to frame GMOs for all subsequent discourse. Coleman and Ritchie argue that this is an under-the-radar metaphor that evokes "monster out of control" and "irresponsible scientist" themes. They argue that this widely used metaphor, stripped of counter-meanings, leaves "little opportunity for cognitive processing" (Coleman & Ritchie, 2011, p. 39). Frankenfood is both emotionally appealing and evokes "fear and anxiety" (Hellensten, 2003). The combination of playfulness, shock value and horror movie schemas have the effect of "side-tracking readers from critical thought" (Coleman & Ritchie, 2011, p. 39). The related theme of "unnaturalness", close to the

heart of romanticism, is a common theme in the sociological literature assessing public opinion on GMOs (Shaw, 2002; Coyle & Fairweather, 2005; Solli, Bach, & Åkerman, 2014).

By the 1990s Greenpeace decided to 'up the ante' by staging spectacular events to attract media attention. On 6 April 1995 Greenpeace announced that it had: "intercepted a package containing rice seed genetically manipulated to produce a toxic insecticide, as it was being exported" and swapped it with ordinary rice (from a Greenpeace media release quoted in Miller & Conko, 2004, p. 44). Miller and Conko describe the wide publicity gained for the cause by this audacious larceny. The *Bt* toxin, inserted into this GM rice, is so safe to humans that organic farmers are permitted to spray it on their crops (Chien, 2015). The stolen rice was on its way from the Swiss Federal Institute of Technology to the International Rice Research Institute in the Philippines. With events such as this, the media began to use Greenpeace phraseology of "toxin", "danger" and "contamination". [See the entry on *Bt* in the Glossary.]

Given the more precautionary approach of the European Union, and under pressure from Friends of the Earth and Greenpeace, throughout the 1990s England's tabloid media regularly turned to the GM Frankenfood theme for scary headlines. The London *Express* ran headlines such as "Mutant Crops Could Kill You," and "Is Baby Food Safe?" The *Daily Mail* contributed: "Mutant Crops Threat To Wildlife." And the usually more temperate *Guardian* ran "Gene Crops Could Spell Extinction For Birds" (Otto, 2011, p. 47).

In 2000 at an OECD conference (*GM Food Safety: Facts, Uncertainties and Assessment*), GM proponents raised the issue of food shortages in Asia and Africa and how these could be alleviated by access to GM crops. According to the *New York Times*, Greenpeace anti-GM campaign organiser, Benedikt Haerlin, dismissed the importance of saving "African and Asian lives at the risk of spreading a science that he considered untested" (McNeil, 2000). The framing here is obviously by the pro-GM standpoint: starving people in Africa can be saved if they have access to GM crops. But still the Greenpeace reaction is quite startling. In the 2000s a number of African countries refused food aid because it was genetically modified: Zambia (BBC, 2002), Angola (Scott, 2004), Zimbabwe (Mpofu, 2010), Malawi and Mozambique. The then Zambian President, Levy Mwanawasa, blocked GM food aid for the 2.5 million Zambians facing starvation, calling it 'poison' (Michael, 2002).

In their book[13] Schurman and Munro start their section on the origins of the anti-GM movement with the heading: "A tale of Two Lifeworlds" (Schurman & Munro, 2010). In 2003 Rachel Shurman attended two back-to-back conferences: one in St Louis Missouri included about 180 anti-GM activists from all over the USA. Themes included "environmental racism, plant patenting and the commodification of life, and the corporate control of agriculture" (Schurman & Munro, 2010, pp. xxvii–xxviii). Themes expressed throughout the conference included a deep mistrust of the US government and large corporations, regulatory agencies and the research done by universities. These concerns, as well as the potential environmental and human health impacts of GM food, have continued to be the movement's key claims against the industry.

13 *Fighting for the Future of Food: Activists versus Agribusiness in the Struggle over Biotechnology*.

The second conference was the World Agricultural Forum at the Hyatt Hotel in St Louis. For an entry fee of $600–1,000 participants were able to here speakers including Norman Borlaug, who won the Nobel Prize for his work on the Green Revolution and a leading advocate of genetic modification. The principle themes of this conference were the need to increase agricultural productivity and eliminating trade barriers. Schurman comments that she was surprised how much she thought about the gulf in worldviews between these two events.

So after more than 20 years of a movement in opposition to genetically modified food, what is their message today? While there are a wide range of responses to GM food, the activist movement is riddled with tales of impending doom (Frankenfood and the like) and contrasts with the 'naturalness' of organics.

The Greenpeace website has a page that outlines the organisation's opposition to GM food headed *Genetic engineering could be a threat to human and environmental health* (Greenpeace, 2015). I will briefly analyse the content of this web page to see how the leading international anti-GM group summarises its arguments.

Firstly, it seems surprising that after over 30 years of campaigning against GM food, the heading for this page says that GM food "could be a threat". The logical implication is that no *actual* threats have been detected but there remains the possibility that there are unknown threats out there which may materialise in the future. The introductory paragraph says that molecular biology could assist us in "understanding nature and provide new medical tools." Indeed GM technology is by far the most common method to produce insulin, human growth hormones and human serum albumin, and is currently being used in a very promising cancer treatment where patients are injected with genetically modified versions of their own immune cells (Cerier, 2015). The anti-GM movement has not tried to gain support to curb this form of genetic engineering.

Next, under the heading "What's wrong with genetic engineering (GE)" Greenpeace make the following points.

> These genetically modified organisms (GMOs) can spread through nature and interbreed with natural organisms, thereby contaminating non 'GE' environments and future generations in an unforeseeable and uncontrollable way.

Greenpeace uses the emotive term "contaminating". But if the GMO in question is safe, then the interbreeding cannot be considered contamination. Again this is not an assertion of problems with GM food today or over the last 30 years but what might happen in the future. The web page continues:

> Their release is 'genetic pollution' and is a major threat because GMOs cannot be recalled once released into the environment.

With 174 million of hectares (Compass, 2013) currently covered by GM crops, one would think the horse has well and truly bolted. However, this sentence uses another the emotive word: "threat". More on the theme of emotion and framing the debate as natural–pure *versus* unnatural–polluted in Chapter 2.

The last section of the page is headed: "We believe".

> GMOs should not be released into the environment since there is not an adequate scientific understanding of their impact on the environment and human health. We advocate immediate interim measures such as labelling of GE ingredients, and the segregation of genetically engineered crops and seeds from conventional ones.
>
> We also oppose all patents on plants, animals and humans, as well as patents on their genes. Life is not an industrial commodity. When we force life forms and our world's food supply to conform to human economic models rather than their natural ones, we do so at our own peril.
> (Greenpeace, 2015)

Starting with the heading: yes this is a belief system. There are no concrete assertions on this page about what harm GMOs have done or will do. This section reflects the theme of this thesis that attitudes at either end of the anti-GM food movement are largely based on belief and ideology which generates an emotion-filled aversion for this 'un-natural' product.

Trust

Mistrust in authority is a key aspect of romanticism and is an important reason why people seek information from non-traditional sources on issues they feel very uncomfortable about. For those with a romantic worldview scientists, companies and governments are all 'suspect' because of their association with capitalism (see Chapter 2 for the links between anti-capitalism and romanticism).

With a high degree of scientific consensus about the safety and efficacy of GM food, what is the basis for the anti-GM movement? As Ropeik puts it: if "leading science panels agree that the evidence is overwhelming that GMOs pose no known risk to humans, that climate change caused by human activity is real, and that vaccines don't cause autism" (Ropeik, 2014), why is opinion on these matters so divided? My contention is that the romanticism belief system is the ideological basis for the anti-GM movement. I hope to throw light on this subject through an examination of readings in sociology, history, philosophy and politics on this worldview. I will then apply this perspective in the analysis of my research findings.

With millions of webpages, and countless conferences, demonstrations and journal articles, the genetically modified food debate has been protracted and heated. While other technological issues have caused concern and some opposition, GM food has been unique in the strength and longevity of the debate. But the anti-GM movement is not like other single-issue campaigns – it has been long term, emotion-ridden and unresolved. Brossard and Nisbet suggest that: " … no single science-related topic has generated as much speculation, concern, and research as the cross-Atlantic divide over agricultural biotechnology" (Brossard & Nisbet, 2006, p. 25).

According to Sidney Tarrow, one of the leading New Social Movement scholars of the 1990s, movements tend to go through a series of phases from an initial spark of conflict, through campaigning and perhaps some push-back, through to either stalemate or a resolution. As he puts it:

> … a phase of heightened conflict and contention across the social system that includes: a rapid diffusion of collective action from more mobilized to less mobilized sectors;

> a quickened pace of innovation in the forms of contention; new or transformed collective action frames; a combination of organized and unorganized participation; and sequences of intensified interactions between challengers and authorities which can end in reform, repression and sometimes revolution.
> (Tarrow, 1994, p. 153)

With wide acceptance in agriculture and food retailing in many parts of the world you might expect activists to furl their banners and admit defeat. But that is far from the case.

So what is it about the ideology or worldview of people who oppose GM food that elicits such a range of reactions? And what is it about GM food that 'pushes their buttons'? The next chapter looks at what is a worldview, the history of classicism and romanticism, and the relationships between romanticism and food, science and nature.

Chapter 2: Romanticism and its relationship with food, science and the environment

The chapter attempts to briefly explore three themes that intersect in the GM food debate: the relationship of romanticism with food, science and the environment. In the last quarter of the 20th century and thus far in the 21st, romanticised consumers have sought to re-enchant their world (or at least their dining table) with food that is slow, organic and 'natural'. The difficult relationship between science and romanticism is key here as the safety of GM food is questioned. And the love of nature and environmentalism comes through in the many ways that GM crops are alleged to be impacting on nature.

The food we eat, how we cook it and the manner in which we eat it says a lot about who we are. The multiple layers of cultural baggage attached to food mean that the choices we make, the narratives about food that we tell ourselves and others, express how we see ourselves and how we would like to be perceived. It is possible to view genetically modified food as an extension of the normal technological development of the food industry and accept the word of science and the industry that it is perfectly safe. It is of course also described as a huge potential danger to human health and the environment, as well as a vehicle for corporate monopoly of food production. If this latter way of looking at GM food is underpinned by romanticism, what are the historical and philosophical roots of this worldview?

A clear majority of Australians think genetic modification of food is a useful technology (Dept. of Innovation, Industry, Science & Research, 2010).[14] The example of Greenpeace protest action in Canberra, mentioned in the introduction, is an expression of the most highly motived amongst opponents of GM, backed up by thousands of organisations around the world, with millions of web pages explaining the 'dangers' of GM food. Many of the large number of people around the world who are opposed or highly suspicious of GM food are influenced by activist messages. There is considerable recent scholarship that suggests that a combination of traditional protest action with social media campaigns have a high impact on public opinion and increase numbers involved in activism (Brulle, Carmichael, & Jenkins, 2012; Harlow & Harp, 2012; Olorunnisola & Martin, 2013).

But mainstream science has arguably a higher rate of unanimity around the efficacy and safety of genetically modified food than on anthropogenic climate change. Support for GM food has been declared by the US National Academies of Science (Masters, 2004), the American Association for the Advancement of Science (AAAS Board of Directors, 2012), the American Medical Association ("AMA statement," 2012), the science advisor to the European Commission (Fleming, 2012), the Royal Society of Medicine (Key, Ma, & Drake, 2008), the Australian Academy of Science (Higgins, 2007) and Australia's Office of the Gene Technology Regulator (Meek, 2013). In short, there is no scientific evidence that any GM crop has any adverse environmental or human health impacts.

14 For example, the question: "Do you support using biotechnology in the production of food from plants?" received 65% support. The survey sample consisted of 1,024 people from across Australia.

According to *Scientific American*:

> The American Association for the Advancement of Science, the World Health Organization and the exceptionally vigilant European Union agree that GMOs are just as safe as other foods. Compared with conventional breeding techniques – which swap giant chunks of DNA between one plant and another – genetic engineering is far more precise and, in most cases, is less likely to produce an unexpected result.
> (S.A. Editors, 2013)

According to *Forbes* magazine, Americans have been consuming GM food for over 20 years and today about 70% of grocery items contain GM ingredients (Hennessey, 2012). Of the trillions of meals consumed containing GM ingredients there are no documented cases of adverse side-effects. Nor have there been any substantiated cases of serious environment impact.[15] So, if there is no documented scientific basis to concerns about GM food, why do large numbers of people around the world fear for the safety of human beings who consume GM food and express concern over the impact on the environment of genetically modified organisms?

What is a worldview?

As children grow they interact with the world and start to build up concepts from the environment around them. As we age we start to develop more complex ethical, moral and political ideas about the world and our place in it (Sagatova & Abeshova, 2013). We use these values, thought of collectively as a 'worldview', as our collective idea of what kind of person we think we are, to inform our decisions and actions, and to pass judgement on the words and actions of others (Vidal, 2008; Hedlund-de Witt, 2012). Carvalho's succinct definition is that a worldview is: "a belief system concerning the nature of reality and how one acts as a subject in reality" (Carvalho, 2006, p. 113).

Today's political polarisation can be seen, at least in part, as a manifestation of the traditional left–right divide. But the GM food debate is an illustration of a range of highly emotive issues that do not correspondent to traditional political fault lines. The hypothesis here is that this debate is an expression of a deep-seated and strongly held worldview. Scientists often view opponents of GM food as simply anti-science or neo-Luddites[16]. This opinion is especially true in the science blogosphere (a sample of which are shown in Table 3). The table shows a list of pro-science bloggers and the headlines on pages attacking the anti-GM movement.

15 One current environmental anti-GM focus is on the falling numbers of monarch butterflies in the US and elsewhere. While the Bt insecticide in GM corn kills these and other butterflies, so does the spraying of insecticide on non-GM crops. A statement by the UN's Food and Agriculture Organisation (FAO) points out a number of simple and commonly used farming techniques to minimise the impact on non-target insects (FAO, 2015).

16 Many of the science bloggers in Table 3 use these terms to refer to anti-GM activists. Former Greenpeace leader, Mark Lynas, refers to this campaign as "neo-Luddite" and equivalent to anti-vaccine conspiracy theories (https://www.youtube.com/watch?v=jYaewOBGybw).

Table 3. Science bloggers rail against 'anti-science' campaigns

Web page title	Page headline	URL
Discover Magazine "Collide-a-Scape" blog	The Economist: Anti-GMO Greenscare "unscientific and dangerous"	http://blogs.discovermagazine.com/collideascape/2013/12/07/economist-anti-gmo-greens-unscientific-dangerous/
Discover Magazine "Collide-a-Scape" blog	"Progressives Have a Science Battle to Wage"	http://blogs.discovermagazine.com/collideascape/2013/06/04/progressives-have-a-science-battle-to-wage/
Science Blogs	Anti-vaccine quackery, anti-GMO pseudoscience, and climate change denialism: Is there a connection other than crank magnetism?	http://scienceblogs.com/insolence/2013/10/03/antivaccine-antigmo-agwdenial/
Genetic Literacy Project	Michael Pollan as GMO 'denialist' dupes credulous *New York Times*	http://www.geneticliteracyproject.org/2013/10/22/michael-pollan-brags-about-twisting-facts-to-support-anti-gmo-activism-and-duping-credulous-new-york-times/#.UwMqk_QW18E

The opposition to GM food spans the political spectrum from mainstream environmental groups such as Greenpeace and Friends of the Earth, to farmer organisations and politicians, through to far-right conspiracy theory websites (see Table 4). Proponents of GM food – scientists and agribusiness – have little time for (or understanding of) the emotion-laden arguments of the anti-GM movement.

Table 4. A cross-section of anti-GM websites

Website title	Page headline	URL
Blog: Crisisboom (right-wing Christian)	WikiLeaks: GMO conspiracy reaches highest levels of US Government	http://crisisboom.com/2011/02/26/wikileaks-gmo-conspiracy/
Centre for Research on Globalisation website (left-wing anti-globalisation website)	"Doomsday Seed Vault" in the Arctic – Bill Gates, Rockefeller and the GMO giants know something we don't	http://www.globalresearch.ca/doomsday-seed-vault-in-the-arctic-2/23503
The Liberty Beacon (right-wing conspiracy theory website)	Monsanto, GMO's, Big Pharma and the Government – They're Killing Us	http://www.thelibertybeacon.com/2013/08/30/monsanto-gmos-big-pharma-and-the-government-theyre-killing-us-11650/
Gary Null YouTube channel ["Seeds of Death" movie. Also anti-vaccine material, 5 HIV/AIDS conspiracy videos]	Seeds of Death	https://www.youtube.com/user/GaryNullTV
Laissez Faire Letter	Have You Noticed We're Getting Sicker than Ever Before?	http://research.lfb.org/research/html/lfl_gmo_0714

So, if we are to argue that the anti-GM position is largely driven by the worldview of romanticism, where did this ideological position come from? According to some of the leading social scientists of the 20th century, described by a variety of different terms, this worldview is as old as human history (Lovejoy, 1936; A. W. Gouldner, 1973; Berlin, 1999b; Ossewaarde, 2007). Lowy & Sayer confirm that romanticism has deep roots but that it only takes its modern form and reshapes human consciousness with the rise of "its antithesis": capitalism (Lowy & Sayre, 2001). The modern manifestation of classicism (or scientism) can be directly traced back to the enlightenment. The next section outlines the historical and philosophical roots of these worldviews.

There is a considerable amount of literature, most commonly from sociology and science and technology studies, attacking scientism (such as Philip Kitcher's "The trouble with scientism") (Kitcher, 2012). The vast bulk of the literature about romanticism focuses on literature; romantic literature of the 19th century. On occasions romanticism is mentioned as an aspect of the thinking of some of those involved in the environment movement who have a particularly transcendent view of nature. It is only in a few dark recesses of academic discourse, that some speak of these worldviews as age old, consistent aspects of the human experience. In order to make a plausible case that the romanticism worldview is a significant motivating factor in the anti-GM movement it is necessary to trace the history of thinking on this subject through to the role of romanticism in the development of the environment movement, its attitude to science and its influence on food preferences.

For example, the preoccupations exhibited in romantic literature point to consistent romantic themes in other areas. A disenchantment with the capitalist world, a love of unspoilt nature, emotionalism, and a sceptical view of science are among the characteristics that feature in the romantic novels, poetry and essays of the 19th century, and continue in the movies, literature, and social movements of the 20th and 21st centuries.

The enlightenment

The excitement and expectation of the age of enlightenment is well illustrated by paintings of the period the emerged in the late 18th century (Reill & Wilson, 2004). *The Orrery* by Joseph Wright, painted in 1765, shows a group gathered around a scientific experiment in progress. A gas light at the centre of the orrery – a mechanical representation of the solar system – is seen to illuminate the faces of the observers. The imagery is obvious – the light of knowledge illuminating scientific inquiry, unlocking the secrets of the universe that are shown to be as orderly as a clock.

Figure 2. Joseph Wright, A Philosopher Giving a Lecture on the Orrery, in which a lamp is put in place of the Sun, 1766. Oil on canvas, 147.3 x 203.2 cm. Derby Museums and Art Gallery, Derby. Photo: Derby Museums and Art Gallery.

It was a period in which all human beings in the West began to change the way they thought about themselves and the world around them. According to Moore & Runes, the enlightenment was a "cultural period distinguished by the fervent efforts of leading personalities to make reason the absolute ruler of human life, and to shed the light of knowledge upon the mind and conscience of any individual" (Moore & Runes, 1946, p. 92). Philosophers and scientists in Europe and North America wanted to build societies based on reason. The religions that had motivated the wars that followed the Reformation were under challenge. The aim was to throw off the shackles of absolutism, both politically – denying any basis for autocracy – and morally – opposing the restrictions on many aspects of life by religious institutions. The iron rule of monarchies, coupled with the churches, who had tried to maintain tight control on all forms of public discourse, were being challenged by philosophers, artists, writers, politicians and merchants who strove to create societies based on science and rationality (Outram, 2005). Many artists of this period depicted the intellectual ferment of the time: scenes of scientific experimentation and the beginnings of the Industrial Revolution – the rapid expansion of cities, railroads, steam power, gas and then electric light, factories and machines.

The importance of this massive shift in how human beings understood the world and their place in it cannot be overstated. Michel Foucault has claimed that the enlightenment is largely responsible for the outlook of modern humans. According to him the changes brought about at that time determined "what we are, what we think, and what we do today" (Foucault, 1997, p. 32). While Foucault is talking about a more scientific attitude to how the world works – a view less dependent on mysticism – such a view of the world is not universally accepted today.

The philosopher Isaiah Berlin was more drawn to romanticism and provides a counterbalancing view:

> The rationalists of the eighteenth and nineteenth centuries saw no purpose in anything but what man himself had created to serve his own needs, and regarded all else as determined by the laws of cause and effect, so that most things pursued no purposes, but were as they were, and moved and changed as they did, as a matter of 'brute' fact.
> (Berlin, 1988, p. 8)

Berlin was putting the case that without beauty, emotion, love, nature and spirit, humans were left only with 'brute facts' and were reduced to the level of automata.

The great thinkers of the enlightenment – Bentham, Burke, Catherine the Great, Descartes, Diderot, Benjamin Franklin – influenced by the scientific revolutions occurring at that time, believed in bringing the light of science and reason to the world and as a result brought into question traditional ideas about all aspects of intellectual and social life. The scientific revolution, combined with the belief that the universe behaved according to universal and unchanging laws, provided a model for looking rationally at human institutions as well as nature (Hochstrasser, 2006).

While the enlightenment and the burgeoning of industrial capitalism are more-or-less contemporaneous, they are not one and the same. But the enlightenment provided the technical, political and philosophical preconditions that allowed capitalism to flourish. The specific conditions in each country in Europe during the 17th and 18th centuries had a major impact on how the enlightenment unfolded and how it related to the development of capitalism. The rise of capitalism wreaked havoc in the European countryside, with severe social, economic and environmental impacts. According to Eric Hobsbawn, in the first quarter of the 19th century, mechanised British cotton mills destroyed the livelihood of the vast Silesian cottage linen industry. Enclosure Acts from 1760 to 1830, combined with the opening of new mines and factories, transformed rural England (Hobsbawm, 1962). The seizure of communal land for private profit spread throughout north-western Europe (Nitz, 1992).

Classicism

Arthur Lovejoy (1873–1962) was an influential American philosopher and intellectual who founded the discipline known as the 'history of ideas' with his brilliant work, *The Great Chain of Being* (Lovejoy, 1936). He described classicism as the "rationalism of the Enlightenment". In a lecture in 1930 he set out nine key characteristics of this worldview:

- reason was universal and differences of opinion or taste are evidence of error;
- all human beings can reason and this is the only important characteristic we possess;
- truth about our world and our place in the universe is available to all human beings as revealed by Nature or God;
- the gifts of nature are equally distributed and every form of nationalism or racism should be condemned as nonsensical;
- the way human beings should behave is obvious and known from the time of prehistory;
- one person's intelligence is as good as another's;

- the presumption that knowledge is universally accessible and verifiable leads to the axiom that all complex reasonings about obscure matters, beyond the grasp of ordinary people, are likely to be unimportant and probably untrue;
- if fundamental truths are self-evident then early, less sophisticated societies were in a better position to detect and understand them as they were not afflicted with the "prejudices" of modern, more complex societies; and
- all past societies not guided by pure reason and self-evident morality were not "progress" but rather the opposite of progress.

  (Summarised from A. Lovejoy, 1932, pp. 282–291)

The rapid expansion of industrial capitalism in Europe in the nineteenth century was fuelled by resources from the colonies, new technology and underpinned by enlightenment ideas of the domination of nature by science and commerce. While, as Marx predicted, market relations have extended into every area of human activity[17], the modern world still has monarchies, superstition, religion, and ignorance; further illustrating the gap between capitalism as an economic system and enlightenment ideas.

The French biologist, Jacques Monod, published a book on human evolution called *Chance and Necessity* (Monod, 1974). As an aside in this text, he rails against those who attack biologists for reductionism "as a revival of vitalism and animism" (Cotgrove, 1978, p. 362).

> It is a very stupid and misguided quarrel, which merely testifies to the holist's total lack of understanding of scientific method and the crucial role analysis plays in it.
> (Monod, 1974, p. 82)

The question of reductionism is an important underlying theme in the romanticism–classicism divide. On a practical level, scientists attack complex systems by breaking them down into their component parts, endeavouring to understand how they work and then suggest hypotheses about the larger system. On a philosophical level, reductionism asserts that an object, including humans, are no more than a sum of their parts, down to the level of atoms and interacting chemical systems. This is the binary opposite view to romanticism which seeks to look at the world holistically.

Francis Crick, the English molecular biologist and neuroscientist, and co-discoverer of the structure of DNA, was a staunch defender of science and thought that romanticism was the legacy of a bygone, pre-scientific era. Partly aimed at figures like Theodore Roszak[18], and more broadly at the social sciences in general, his advice to university administrators was:

17 "The bourgeoisie has stripped of its halo every occupation hitherto honoured and looked up to with reverent awe. It has converted the physician, the lawyer, the priest, the poet, the man of science, into its paid wage labourers. The bourgeoisie has torn away from the family its sentimental veil, and has reduced the family relation to a mere money relation" (Marx & Engels, 1847, p. 16).

18 The artist, designer and academic, Theodore Roszak, wrote two influential books: The Making of a Counter Culture*: Reflections on the Technocratic Society* (Roszak, 1969), and *Where the Wasteland Ends: Politics and Transcendence in Post-industrial Society* (Roszak, 1972). Roszak tried, from the

> … to see that their universities become centres for the propagation of a new culture (science), and not merely homes for propping up an ageing and dying one.
> (Crick, 1968, p. 22)

In the GM debate there are many fiery defences of science which the authors see as under attack from the dark forces of obscurantism. The book *The Frankenfood Myth* is a well-crafted exposition of the case for GM food but it does also take the occasional journalistic swipe at the opposition. At various points the authors refer to Greenpeace and the like as "bomb throwers", as purveyors of "arrogance and tortured logic", liars and "vandals" (Miller & Conko, 2004).

Cook *et al* discuss a critical component of how many scientists (consciously or unconsciously) frame the production of knowledge – the division of the world into 'scientists' and 'the public' (Cook, Pieri, & Robbins, 2004). As the title of their paper suggests *('The Scientists Think and the Public Feels': Expert perceptions of GM Food*) the GM scientists interviewed for this study saw the category 'scientists' as a homogenous group of professionals who spent their time adding to the sum total of human knowledge by the application of scientific method. The 'public' did not understand science and this was why some had superficial and "irrational" fears[19] such as not embracing GM food. "The GM debate is thus reduced to being merely the latest in a series of 'food scares' created and aggravated by the media" (Cook *et al*., 2004, p. 437). The scientists hug close to the frame of empirical objectivity, pouring scorn on non-expert views as emotional and therefore irrelevant.

Romanticism

Romanticism developed as a powerful countervailing force to the enlightenment's excesses of classicism, the counter-position of feeling and sensibility to rationality. Romanticism has continued to be a huge influence since that time on culture, philosophy and politics. In a similar way to Foucault's privileging of the enlightenment, the eminent philosopher Isaiah Berlin rather saw romanticism as the most important movement in modern thought:

> The importance of Romanticism is that it is the largest recent movement to transform the lives and the thought of the Western world. It seems to me to be the greatest single shift in the consciousness of the West that has occurred, and all the other shifts which have occurred in the course of the nineteenth and twentieth centuries appear to me in comparison less important, and at any rate deeply influenced by it.
> (Berlin, 1999a, pp. 1–2)

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perspective of romanticism, to provide some coherence to countercultural ideas but to maintain a respect for scientific method and materialist philosophy.

19 Forbes magazine: "Five irrational fears even rational people have", http://www.cracked.com/article/158_5-irrational-fears-even-rational-people-have_p2/
Wall Street Journal: "The irrational fear of GM", http://www.wsj.com/articles/SB10001424052702303680404579141741399966328
Genetic Literacy Project: "Vandana Shiva responsible for 'irrational' fears of GMOs", http://www.geneticliteracyproject.org/2014/09/05/vandana-shiva-responsible-for-irrational-fears-of-gmos-dismisses-science-that-doesnt-suit-ideology/

Here Berlin is talking about the range of human endeavour, from art, music and literature to philosophy and architecture. What is commonly known as the Romantic period, roughly the 1790s to the 1860s, was initially fuelled by the work of Rousseau in France, Goethe and Kant in Germany and poets on both sides of the Atlantic – Coleridge, Wordsworth and Byron in Britain and the Americans Emily Dickinson, Ralph Waldo Emerson, Henry Thoreau and Walt Whitman.

Romanticism is very difficult to define. Arthur Lovejoy listed 18 variations of the meaning of romanticism, then gave up on the idea of trying to define it (Lovejoy, 1924). Rather than a definition I will try to briefly outline the range of expressions of romanticism and its ongoing impact on Western thought. Almost a defining aspect of romanticism is its many apparent contradictions. As opposed to the *relatively* consistent focus of classicism, romanticism can be "simultaneously (or alternately) revolutionary and counterrevolutionary, individualistic and communitarian, cosmopolitan and nationalistic, realist and fantastic, retrograde and utopian, rebellious and melancholic, democratic and aristocratic, activist and contemplative, republican and monarchist, red and white, mystical and sensual" (Lowy & Sayre, 2001, p. 1). Romanticism has no political allegiance and can produce emotions from ecstatic highs to melancholia.

Romanticism does not have a political character in the conventional sense. It is neither politically progressive nor reactionary because its key drivers are not about the hard-headed realities of politics but rather about feelings and sensations. However, not being politically motivated in a traditional left or right sense is a political decision. In the words of Friedrich Schlegel, romanticism is: "religion, philosophy, nature and art," (Schmitt, 1919, p. 42). One of the leading theorists about the politics of romanticism was the US sociologist Alvin Gouldner. He saw the political expressions of romanticism in wars and revolutions as primarily seeking "cultural revitalisation," (Gouldner, 1973, p. 323). Looking at Lowy and Sayre's thesis through this lens sees romantics opposing capitalism to replace it *culturally* with a pre-capitalist environment. As applied to the GM debate, there are many right-wing conspiracy theory websites that are anti-science (GM, fluoridation, vaccine and climate change). The key right-wing attack on GMOs are fears of dark conspiracies between government, big business and science. Examples of conservative anti-GM websites using romantic anti-capitalist and anti-science rhetoric are "The Liberty Beacon" (http://www.thelibertybeacon.com); "My Logic of Truth", (https://mylogicoftruth.wordpress.com/) and "Right Wing News (http://rightwingnews.com/).

Despite this ambiguity, Lucien Goldman (Goldman, 1976), as well as Lowy and Sayre, see romanticism *not* as a "vague list of ideological themes but rather a coherent totality organised around an axis or frame" (Lowy & Sayre, 2001, p. 18). They see romanticism as a specific form of critique of modernity. Lowy and Sayre describe modernity as the multifaceted civilisation that developed in conjunction with industrial capitalism. "The Romantic sensibility is bound up with loss, the painful conviction that in modern capitalist reality something precious has been lost" (Sayre & Lowy, 2005, p. 435) and the accompanying longing for an idyllic pre-capitalist utopia. Small-scale communal agriculture is swept aside by corporate farms, artisans made redundant by factories, internationalised food sold in supermarkets threatening slow food traditions; these are the aspects of romanticism key to the GM debate.

One of the most obvious lasting legacies of the Romantic period is the output of great artists: poets, painters and musicians. But the romantic worldview had a much wider and deeper impact on philosophy, political thought and social criticism (Bute, 2004). Romanticism is not principally a political movement but rather a way of looking at the world; a reaction to the perceived cult of rationality epitomised by the enlightenment; an embrace of nature, idealism, and the unlocking and privileging of the imagination. Philosophers of romanticism championed knowledge not through the scientific method but through direct experience and emotion.

Bute neatly summarises the origins of romanticism as "a reaction to both the excesses of the Revolution of 1789 and the hyper-rationalism of the Enlightenment" (Bute, 2004, p. 255). In its early states it was most prominent in Germany, through the likes of Goethe, Hegel and the Schlegel brothers, Karl and August. In France, Jean-Jacques Rousseau expressed a love of nature and of classical antiquity, and attempted to codify romantic philosophy and political theory. Victor Hugo's *The Hunchback of Notre Dame* and *Les Misérables* were concerned with the struggle for liberty against the church and the aristocracy. In England, the great Romantic poets – Shelley, Keats, Wordsworth and Coleridge – were joined by philosophers Carlyle and Ruskin in championing romanticism.

Many writers on this topic see romanticism as a continuing and important influence throughout human history. Pater is of no doubt that: "the romantic spirit is, in reality, an ever-present, an enduring principle … a very continuous and widely working influence" (Pater, 1947, p. 584). Likewise, Holbrook is of the view that: "throughout history and to varying degrees, romanticism has pervaded a broad range of human experience" (Holbrook, 1997, p. 105). As outlined above with respect to classicism, it aids understanding to look at the different aspects of this complex ideology. Sayre and Lowy list five "thematic constellations" (Sayre & Lowy, 2005, p. 436) that they see as the core of the romantic worldview:

Disenchantment[20] *of the world*

Sayre and Lowy quote Max Weber saying that: "The fate of our times is characterized by rationalization and intellectualization and, above all, by the disenchantment of the world" (Weber, 1946) The romantics used religion, "magic, the esoteric arts, sorcery, alchemy, and astrology … pagan myths, legends, fairy tales" (Sayre & Lowy, 2005, p. 436) in order to re-establish a sense of wonder about life and nature – to 're-enchant' their world. Many in the anti-GM movement see this debate as organic farming *versus* corporate farming, smallholders versus vast areas of monocrop, harking back to a simpler time of village level self-sufficiency. Anti-GM movement rhetoric speaks loudly about the disenchantment with capitalism and the corporate control of food production.

The quantification of the world

Charles Dickens was not a pure romantic but more of a realist and keen observer of social life. However, he was certainly influenced by romanticism. This trait of opposition to the quantification of the world is expressed in this description of a central character in *Hard Times* who is described as a man: "With a rule and a pair of scales, and the multiplication table always

20 For an explanation of the specific meaning of 'disenchantment' as it is used with respect to romanticism, see the Glossary.

in his pocket …, ready to weigh and measure any parcel of human nature, and tell you exactly what it comes to" (Dickens, 1854, p. 7). As everything is a commodity to be weighed and measured, so romanticism contrasted this with unique individuality and wonder; valuing art and the skills of the artisan over mass production and factory work.

The mechanisation of the world

18th and 19th century literature contain many allusions to the destruction of rural life and human dignity that accompanied the widespread use of machines: The steam-driven threshing machine in Hardy's *Tess of the d'Urbervilles* (Meadowsong, 2009), Blake's "Dark Satanic Mills" and again from Dickens' *Hard Times* – the rhythm of the steam-engine's piston, that "worked monotonously up and down like the head of an elephant in a state of melancholy madness" (Dickens, 1854, p. 22). The political corollary was that: "Romantics considered the modern state, based on legal contracts, and a rational bureaucratic administration, to be as mechanical, cold, and impersonal a system as the factory" (Sayre & Lowy, 2005, p. 438). This is indicative of the anti-capitalist nature of romanticism. Unlike most other aspects of pre-capitalist production, the family farm survived well into the 20th century as a vital part of Western food production, as processing and retail were more fully subsumed into the corporate system. Hence many of us still retain an idea of the kind of family farm that were common up to the 1940s and 1950s – largely self-sufficient with a diverse range of livestock and crops. This aspect of capitalism continues today as agriculture is shaped by powerful forces of concentration, mechanisation and the internationalisation of trade. GM crops leading to or reinforcing monoculture and corporate control of agriculture is a recurring theme in anti-GM movement claims-making.

Rational abstraction

Sayre and Lowy quote Marx and Mannheim on the change from concrete relations between people to the abstract relations between things that accompanies capitalism. For Marx: "the capitalist economy is based on a system of abstract categories: abstract work, abstract exchange value, money… Karl Manheim shows the connection between rationalization, disenchantment, and quantification in the modern capitalist world. According to him, 'this *rationalizing* and *quantifying* thinking is embedded in a psychic attitude and form of experience with regard to things and the world which may itself be described as *abstract*' " (Sayre & Lowy, 2005, p. 438).[21] Part of the response to this abstraction by romantic consumers is to attempt to re-establish concrete direct relations with artisans and organic food producers. In the 2000s there has been a rapid expansion in farmers' markets, organic farming and alternative means of funding and distributing food from the organic farming sector. This movement can be seen as an attempt, as Kirwan puts it, to "reconnect food to the social, cultural and environmental context of its production" (Kirwan, 2004, p. 395) but also to provide a direct connection between farmers/artisans and food consumers.

21 Sayre and Lowy quote extensively from Marx but see him not as part of the romantic movement but as influenced by it and in turn inspiring many revolutionary romantics. For an interesting discussion of this topic see (Mah, 1986).]

The dissolution of social bonds

Romantic literature abounds with lost, lonely souls living in an "urban desert" such as Saint-Preux, in Rousseau's *Julie, or The New Héloıse*, "the first in a long line of Romantic, 'Byronic' heroes who feel lonely, misunderstood, unable to communicate in a meaningful way with their fellow human beings" (Sayre & Lowy, 2005, p. 439). Michael Pollan has written at length about the social connectedness established through cooking and eating food. His book, *Cooked: A Natural History of Transformation*, can be seen as an exposition of how cooking civilised humanity. Pollan, José Bové (leader of the French *Confédération Paysanne* – pro-slow food and anti-GM) (Northcutt, 2003), and even Jamie Oliver are championing a counter-narrative about food – buying, cooking and eating food all as social activities, to harken back to a former era when most people had a more direct relationship with the growing of food and to celebrate the social aspect of consuming food made from fresh (organic) ingredients. For romantic consumers, this provides an opportunity to at least re-enchant the kitchen and dining experience. Ironically this is of course provided through the means of capitalist consumption.

Romanticism is much more than a collection of sentiment-filled novels and poems, and some lofty ideas about liberty and the beauty of nature but its political expressions have varied widely. As Isaiah Berlin argues (Berlin, 1999b, p. 147), romanticism is not partisan; political actors inspired by romanticism can cover the spectrum of politics but can commonly be found at either extremity.

The political 'neutrality' of romanticism has continued to this day with the romantic opponents of genetic engineering, including the spectrum from left-leaning environmental NGOs to far-right conspiracist websites.

One of the common themes in romanticism is a longing for somewhere else – either an exotic tribal location, the pre-capitalist past or an idyllic rural setting (Cronon, 1995). As the movement was stimulated by a reaction to the enlightenment and to the social and environmental impacts of capitalism, there is a longing for a simpler time of greater social harmony and a closeness to nature (Faflak & Wright, 2012).

Science and romanticism

The three relationships with romanticism that intersect in the GM food debate are with the environment (nature), with food, and with science. A commonly accepted binary, that obscures rather than illuminates this discussion, is that the enlightenment equals science and romanticism equals anti-science. The reality has been far more complex and interesting. One of the first expressions of the horror and fascination of romanticism for scientific discovery is in the romantic novels of the late 18th and 19th centuries, the precursors of 20th century science fiction.

The story of Mary Shelley's *Frankenstein* is well-known. Dr Victor Frankenstein, driven by an urge he cannot control, delves into esoteric science to reanimate a 'monster' who he has sutured together from the body parts of cadavers and then animates with electricity. In line with the ancient Greek tragedies, this fatal flaw – that Frankenstein "refused to take responsibility for his creation" (Summers, 1986, p. 5) – has grave consequences that lead to murder and mayhem. But which fatal flaw? The common reading of this text is to see it as an act of hubris, of a scientist

playing god and over-reaching his ability to control the outcome of what he has set in motion. The author draws a direct link between the "hubris of the alchemists and the hubris that may abuse the wonderful power of experimental science" (Bartlett, 2007, p. 16).

This novel is often put forward as an exemplary romantic text (Weissman, 1976; Michie, 1988; Gigante, 2010). It illustrates some of the core themes of romanticism and is seen as an example of the continuing love-hate relationship that some in our society today have with science and technology. A more interesting interpretation of the story from Bruno Latour is that as a scientist Frankenstein was highly successful. He achieved what he set out to do. His creature is not only alive but is a sensitive and caring being who interacts with a poor family living in the woods. Latour asserts that where the scientist went wrong was to abandon his creation. This spurning of the creature, plus a subsequent attack on him by villagers, makes him embittered and resentful and ultimately a murderer. In this political parable, Latour sees our sin as "not that we created technologies but that we failed to love and care for them" (Latour, 2011a, p. 2).

Frankenstein is considered to mark the birth of the science fiction genre (Hammond, 2004; Bartlett, 2007). The wide popularity today of science fiction and romantic fiction, as well as romanticism's contribution to cinema – "the most romantic art of all" (Flinn, 1990, p. 1) – shows the enormous legacy of Shelley and her confederates to modern culture.

It is not by accident that images of Frankenstein and the term 'Frankenfood' are used by anti-GM activists. Like all literary texts it is possible to read this novel in different ways. The romanticism of anti-GM activists (and probably the most popular interpretation of this book) sees this as a cautionary tale that includes such lessons as: that science sometimes goes beyond what many consider to be the limits of ethics and prudence; and that 'mad' scientists 'playing god' can unleash dark forces. The secularising 'disenchanting' role of science – turning the wonders of nature into inert pieces of matter by classification, dissection and experimentation – could be applied to *Frankenstein* and to the modern application of science in food production. The way the body of the monster is put together from 'spare parts' is akin to geneticists altering DNA; reductionism of this type in theory and practice is strongly opposed by romanticism, "a reductionism that ultimately leads to existential despair, individual crisis, and communal disintegration" (Hogsette, 2011, p. 531).

The monster is, above all, an artificial human – something 'unnatural'. Bartlett makes a direct link between the theme of the interference of science in nature in *Frankenstein* and modern romantic movements against some technologies. "For the utopian believer in the ideal purity of the ecological object, who sees most modern science as mad science (the rape of nature, the disenchantment of the planet), modern science risks too much the maximal desacralization of the object. Thus we witness the deep resentment of vaccinations, evolutionary theory, nuclear weaponry, genetic engineering, pharmacological therapy; the list is a long one" (Bartlett, 2007, p. 20). According to the romantic worldview nature is sacred, capitalism is the main enemy of nature, so the financial success of companies promoting genetic engineering is further proof of their culpability. Being a 'multinational' has further added to Monsanto's status as an "evil

empire"[22]. The company is also often referred to in anti-GM rhetoric as 'Monsatan', with activists drawing a direct connection between its production of Agent Orange during the Vietnam War and its sales of GM 'poison' today[23]. The high levels of concern around GM food and Monsanto is indicative of the emotion-charged response of activists to the direction of modern corporate agriculture.

Another relevant theme in *Frankenstein* identified by Bartlett is the isolation of scientific decision-making from the community. Victor Frankenstein's self-imposed isolation, locking himself away in his laboratory far from his wife and family, is seen in the novel as contributing to him crossing ethical boundaries and to giving in to his obsession. Like the Science Court (mentioned in Chapter 1) which never eventuated, calls today for greater public involvement in the direction of research go largely unheeded.

Frankenstein also illustrates the heroic romantic figure trying to save the world; the imperative to expose scientific folly as a warning for what the future may hold. The second half of the book's title, "the Modern Prometheus", signals that this novel can be seen as a parable for a Europe undergoing rapid social change, and perhaps that this is what can happen if science and capitalism are allowed a free hand[24]. We can see a similar thing happening in relation to observations made by Beck about risk society. While there are a wide variety of governmental responses to the sale of GM food around the world, from prohibition to mild oversight regimes, it would seem that nothing less than a complete ban would satisfy many current anti-GM activists.

Romanticism in the 20th century

Although romanticism as a worldview is often associated in the public imagination with the 19th century, there has never been a time since that romanticism has not played a significant part in Western culture and politics. Its influence has been considerable in the arts, philosophy and politics (Favret & Watson, 1994; Cronon, 1995; Faflak & Wright, 2012). The eminent

22 A range of websites which include anti-GM material refer to Monsanto as an "evil empire":
http://positivemed.com/2013/05/21/monsanto-an-evil-empire-2/
http://whatgives365.com/2010/09/15/is-monsanto-the-evil-empire/
https://www.pinterest.com/staceyface1/the-evil-empire-monsanto/

23 http://www.monsanto.com/newsviews/pages/agent-orange-background-monsanto-involvement.aspx

24 In Greek mythology, Prometheus was the creator of mankind. The goddess Athena taught him architecture, astronomy, mathematics, navigation, medicine, and metallurgy. In turn Prometheus taught these skills to humans. Zeus, the leader of the gods in Greek mythology, became angry at Prometheus for making people powerful by teaching them all these useful skills. When the gods chose Prometheus as arbiter in a dispute, he fooled the gullible Zeus into picking the worst parts of the sacrificial bull by hiding them under a rich layer of fat. To punish Prometheus, Zeus withheld fire from humans. In response, Prometheus, snuck up to Mount Olympus, lit a torch from the sun, and hid a burning piece of charcoal in a hollow stalk. He slipped away with it and thus delivered fire to mankind. Zeus had Prometheus chained naked to a pillar in the Caucasian mountains. A griffon-vulture ate at Prometheus' liver all day long. During the bitter cold of the mountain night, the liver became whole again. So it went day after day, year after year. Only years later, at the behest of Heracles (Hercules), did Zeus free Prometheus (Graves, 1960).

American sociologist, Talcott Parsons, thought "romantic elements are inherent in the nature of modern societies" (Parsons, 1954, p. 123).

As the rise of industrial capitalism in the 18th and 19th centuries spurred an outpouring of romanticism, so the political and social upheavals of the 1960s led to another revival of romanticism. The wars and revolutions around the world throughout the 1960s signalled an end to the complacency of the post-war boom and a resurgence in causes and movements inspired by romantic ideas.

The progressive "politicization of romantic motives throughout the Western world took place spectacularly and on a broad scale … in the course of the student protest movements of the 1960s" (Brunkhorst, 1986, p. 401). Weiss suggests that the 1960s counter-culture was not just a collection of movements against various social ills but also included attempts to reimagine a simpler, more communitarian world. Like many social movement theorists he draws a direct connection with romanticism by suggesting that all social movements are centred around the romantic goal of 're-enchantment' of the world (Weiss, 1987); of creating a world based on respect for humanity and nature. Others assert similar connections. Bob claims that Native Americans "rode a cultural wave of romanticizing nature and the 'primitive' " in the 1970s and 1980s to push for their rights (Bob, 2005, p. 31):

> Among all these social movements, ecology is probably the one that has taken the Romantic critique of modernity the furthest, through its questioning of economic and technological progress and through its utopian aspiration to restore the lost harmony between humans and nature.
> (Lowy & Sayre, 2001, p. 229)

The 1960s and'70s was period that saw a flowering of concerns associated with romanticism. The dominant themes of this period were "the emancipation of the self from an oppressive society, the return to nature and rejection of industrial society, the primacy of one's feelings, the donning of bohemian appearance, and at the same time the search for a new harmony among human beings" (Tiryakian, 1992, p. 85).

Consuming nostalgia: romanticised food discourse

Another prominent way in which romantic ideas are expressed in contemporary Western societies is around food. The 'back to the land' movement that re-emerged after the Second World War, later inspired "the countercultural back-to-the-land movement of the 1970s, and finally CSAs" (Press & Arnould, 2011, p. 170). Community Supported Agriculture (CSAs) are an extension of the farmer's market concept. Instead of just buying produce from local farmers, consumers sign up to a monthly or annual payment for which a producer will supply them a set amount of fresh food. "CSAs began to develop on the East Coast of the United States in the mid-1980s. Today, it is estimated that between 30,000 and 50,000 U.S. consumers belong to a CSA" (Kelley & Kime, 2013, p. 1). Today there are CSAs across Australia, including state-supported organisations in Tasmania, Victoria and South Australia.

In mainland Europe, unique food cultures have developed in many regions and countries, based on a close association between small-scale farmers and the labour-intensive production of a distinctive regional cuisine. The French version of CSA is Associations for the Maintenance of

Smallholder Agriculture (AMAPs). This began in 2001 in Provence and by 2010 there were 750 AMAPs serving 30,000 families throughout France (Vivas, 2010). Similar organisations also exist in Belgium and Spain. On a European-wide scale the "Vía Campesina Coordinator … brings together organizations and farmers' unions from Denmark, Switzerland, France, Italy, the Netherlands, Spain, Greece, Malta, and Turkey" (Vivas, 2010, p. 1). The VCC coordinates campaigns to oppose Europe's Common Agricultural Policy and GMOs.

In the 1990s in France one of the most vocal opponents of GMOs was led by *Confédération Paysanne* (CP), which at the time was headed by José Bové. Bové and the CP view mass-produced fast food and GMOs in the same category of *la mal-bouffe* (literally 'bad quality food') or "placeless" food; as opposed to food with *terroir* like the milk for Roquefort cheese that José Bové produces on his dairy farm. In 1999 he was arrested for dismantling a McDonald's with a bulldozer in the southern town of Millau (Heller, 2007, p. 612).

Slow food

On the broad level of consumption, Holbrook suggests that romanticism's main impact on consumers is not about buying specific products but the pleasure a person gets from a particular kind of consumption that is in accord with their values. He describes it as a romantic worldview driving a desire for experiential consumption, which evokes emotional responses, which in turn creates a sense of pleasure (Holbrook, 1997).

Everywhere in this debate there seems to appear a dichotomy between classicism and romanticism, between two incompatible views of the world. In an article by Chaia Heller, on the campaign by the CP in France against GMOs, she compares the 'techno-science' view of food quality (shared by most of the food industry and France's National Institute of Agricultural Research), with that of Bové and his supporter's *techne* (hand-made food) illustrated in the following table.

Table 5. Comparison of techne versus techno-scientific notions

Techne-driven food quality	Technoscience-driven food quality
Cultural, qualitative rationality, quality of life for producers, savoir-faire embedded in production process	Instrumental, calculative, rationality product safety for, consumers managed risk of production process

(Heller, 2007, p. 606)

'Disenchantment' with the menu

Despite the fact that food in Western countries has never been safer or more abundant (AIHW, 2012), many consumers are 'disenchanted' with mainstream supermarket food. But "safe" here is a relative term. Many food scares over the last few decades have heightened awareness of food safety issues. "Food additives, the impact of pesticide residues, Bovine Somatotrophin, Alar (a plant growth inhibitor used on apples), the development of genetically modified (GM) foods, Creutzfeldt-Jakob Disease (CJD), swine vesicular disease and … foot and mouth disease have all to various degrees raised questions about the relationship between risk and food" (Denney, 2005, p. 61). Each of these instances are beamed around the world by mainstream media, discussed on social media and analysed by bloggers and specialist websites. Latent fears

about food safety combine with a general unease amongst some consumers of what Goodman *et al* refer to as "place-less and face-less" food (Goodman, Goodman, & Redclift, 2009, p. 13). No name coffee can be substituted with Nicaraguan Fair Trade Coffee. The *terroir* of food is now a major part of food retailing in supermarkets, farmers' markets and restaurants. Food is sold through stories about its geographic origin and production methods (Freidberg, 2003).

Part of the disenchantment is the reaction of romantic consumers to a renewed awareness of the role of science into food production. In the specific case of GM food, Tait sees the principle reason for much of the resistance to GMO's as "the Faustian bargain we have made, putting science, technology and the industries that control them in charge of world food production systems […] that lack democratic control" (Tait, 2001, p. 185). Today in order to appeal to disenchanted shoppers, increasingly food is "sold with a story" (Freidberg, 2003). Through packaging and advertising, companies attempt to attach a narrative of authenticity around their product to distinguish it in the marketplace; that it is made in an idyllic green valley, under healthy conditions, to a time-honoured recipe, by a friendly organisation with a long history.

'Natural' food

The debate over what food is healthy has been problematized by journalist Michael Pollan. His theme is that, especially in America, ideology about food is dominated by 'nutritionism'. He asserts that the four facets of this ideology are: (1) seeing food as a "delivery system for nutrients"; (2) that if you cannot see what is healthy you need to be informed by experts – nutritionists and other health professionals – whose views are then used as marketing copy by food retailers; (3) this discourse is all about 'good' and 'bad' nutrients (e.g. good anti-oxidants and bad trans-fats); and (4) that the whole point of eating is health (Pollan, 2008).

Pollan juxtaposes this dissected and *scientised* view of food with what he sees as the preferable historical role food has played: that food was (and should be) part of community and family; fostered cultural identity; was a key part of religious ceremonies; and was used to engage with nature. Rather than a battle of nutrients he prescribes moderate amounts of meat and fish with plenty of fresh vegetables and fruit. While this is in part a common-sense view of food, it is also a perfect example of the division between classicist and romantic ways of seeing the world. Scientists, whether nutritionists or biotechnologists, want to dissect plants and seeds into their constituent parts, even down to the level of DNA, while romanticists see food as symbolising layers of social meaning – a healthy diet is as simple as following 'tradition'. Neither is right or wrong in any moral *or* technical sense. But looking at food (or many other issues) solely from one of these narrow points of view is assured to irritate the other. However, it is interesting to note that even someone like Michael Pollan sees no harm in GM food. He is quoted by the US National Public Radio (NPR) as saying that: "I haven't seen any evidence that's persuaded me that there's any danger to health." He sees the GM debate as one not about science but the right of consumers to have information. "I think it's a fight about transparency – people who want to know where their food comes from should have this information." (Kaste, 2013)

Summary

From the various definitions and commentaries above, a number of consistent themes of romanticism come forward, and these will be used in the analysis of the open questions in the survey in Chapter 4. These include:

- reducing complex moral and political issues to black and white, good and evil;
- the centrality of the emotions as a source of truth and a downplaying of the intellect;
- opposition to industrial capitalism in the name of pre-capitalist values (longing for the restoration of a medieval civilisation or some other simple bucolic utopia);
- disenchantment with the world as it exists and seeking re-enchantment through imagination or at least through 'experiential consumption' (e.g. organic food or Fair Trade coffee);
- inspired by magical thinking, fantasy and story-telling;
- a deepened appreciation of the beauties of nature; emotion over reason and of the senses over intellect;
- a turning in upon the self and a heightened examination of human personality and its moods and mental potentialities;
- a preoccupation with the genius, the (Byronic) hero, and the exceptional figure in general, with a focus on his passions and inner struggles;
- a new view of the artist as a supremely individual creator, whose creative spirit is more important than strict adherence to formal rules and traditional procedures;
- an emphasis on imagination as a gateway to transcendent experience and spiritual truth;
- an obsessive interest in folk culture, national and ethnic cultural origins, and the medieval era; and
- a predilection for the exotic, the remote, the mysterious, the weird, the occult, the monstrous, the diseased, and even the satanic.

Given these attributes, scientists altering the DNA of organisms destined to become food rings alarm bells for those with a romantic outlook. Food can be a means for romantic consumers to attempt to take control of what they eat and to re-enchant their lives. Suspicion of 'production science' and large corporations are common romantic tropes. And romanticism sees nature as imperilled by the 'mad' science of genetic modification. This issue is of such concern to those dominated by romanticism that many other societal ills are seen as deriving from it. Cancer and obesity are allegedly caused by GMOs. 'Monsatan' once produced Agent Orange and is now set on dominating world food production and poisoning us all with GM food.

To test this close connection between romanticism and the anti-GM movement a survey instrument was applied to supporters of GM activist Facebook pages. The dual purpose was to use the Romanticism–Classicism Index to get one measure of where participants were situated on this spectrum and to provide open questions for them to describe in their own words what they saw as the main problems with GM food.

Chapter 3: Approach and methods

In this chapter I will describe why I chose the Romanticism–Classicism Index (RCI) and where it has been used previously. Then I will describe the other questions incorporated into the survey, how the survey was administered and some limitations of this approach. The results will then be described and analysed in Chapter 4.

Why a survey

There is a long history, especially in the field of psychology and related areas, of using survey instruments to test attitudes, ideological positions and worldviews (Agheyisi & Fishman, 1970; Dent, 2013). The most obvious, simple and cost-effective way to test the hypothesis that the anti-GM movement is heavily influenced by romanticism was to determine whether there was an existing survey instrument suited to this research question.

Online surveys are a flexible method for analysing attitudes. However, like any test, there are a wide range of potentially confounding factors. These include: sample representativeness; competition for attention; the 'digital divide' – an online survey presupposes digital literacy and access; illiteracy and disability as barriers to participation; low response rates; self-selection as a sampling bias; instructions not clear to all participants; impersonal; and the potential to be perceived as junk mail or spam (Rhodes, Bowie, & Hergenrather, 2003; Evans & Mathur, 2005).

To maximise the validity and usefulness of survey data, it is necessary to be as rigorous as possible in the drafting and validation of the survey instrument and to not go beyond the limits of what you can confidently say based on the data from your sample and survey.

Surveys are a snapshot of the participant's views on a question at a particular time, which may not be their view tomorrow, next week or next year. But the intention of using this survey instrument is to measure the worldview of participants – where they fall on the romanticism–classicism spectrum. These are not casual opinions which change with circumstance but long-lasting, deeply held values. Hence, this particular shortcoming of surveys should not be a major issue in this case.

Survey data is self-report data. Survey respondents can be influenced by a range of unrelated external factors. They can be effected "by what they want us to hear, or sometimes even what they think we want to hear" (Walter, 2012, p. 154).

Causality

Data that establishes a relationship between two variables does not establish causality. If it is found that the sample of anti-GM activists who agree to complete this survey score high on a romanticism scale does not in and of itself prove that this is the "cause" of their views on GM food. However, what that outcome would do is suggest a possible connection or association that would point the way forward for further areas of research. But in addition, analysis of the ideas and language used in the open questions will be a useful additional tool to gain a broad picture of the worldview of the participants, at least in relation to the environment and GM food.

Selection of an index to test romanticism and classicism

A search of the literature on the testing of worldviews revealed that there are a number of closely related theories and survey instruments that claim to test for qualities related, but not identical in breadth and scope, to romanticism. These include the Cognitive–Experiential self-theory (CEST), the Traditional World View (TWV) *versus* the Emerging World View (EMV), the Rational–Experiential Index (REI), and the Romanticism–Classicism Index (RCI).

The most important aspect of the Romanticism–Classicism Index for this research project is that it is attempting to assess an individual's worldview; i.e. a relatively consistent, fundamental way of looking at the world, rather than transient and malleable attitudes or competing ways in which we make judgements (Peters & Slovic, 1996; Dunlap, 2000).

The RCI is a well-designed and tested survey instrument that appeared to do exactly what was required for this research. The Romanticism–Classicism Index was developed by Morris B. Holbrook in the mid-1980s as part of his research into consumer behaviour. The RCI is a semantic differential scale[25] that was used by Holbrook to test his hypotheses that people tended to be either romanticist or classicist to varying degrees, that this fundamental division in human society had very deep roots and that these worldviews were quite consistent over time (Holbrook, 1985). Holbrook was seeking to establish if there was a relationship between where a person is situated on the Romanticism–Classicism continuum and their consumer habits. He points out that the split between classicism and romanticism is a familiar theme in philosophy and he goes on to provide a broad brush outline of these two concepts as: romanticism – "sensitive, emotional, chaotic and free-spirited"; and classicist as "purposive, reasonable, orderly, and controlled" (Holbrook, 1986, p. 338). Holbrook is the only researcher I could find who has sought to explicitly measure degrees of romanticism; the extent to which individuals adhere to romantic ideas.

Holbrook developed the questions for the Romanticism–Classicism Index following a rigorous search for relevant aspects of these worldviews across a wide range of disciplines including history, philosophy, aesthetics and art criticism. The 55 questions of the Index were the result of testing and refining a previous 126-item scale developed by Eric Greenleaf (Holbrook, 1986). This 55-item scale underwent testing and statistical validation by Holbrook and was then used in research projects by him and other researchers (Holbrook & Corfman, 1984; Holbrook, 1985; Holbrook & Onley, 1995; Holbrook, 1997; Nairn & Berthon, 2003; Nairn & Berthon, 2005; Kruiff, 2011). Holbrook has made the full 55 question Index readily available for use by other researchers (Holbrook & Onley, 1995). While 55 questions is a considerable number, it can be answered in under 15 minutes making it an acceptable length.

25 A semantic differential scale is a list of opposite adjectives. It is a method invented by C.E. Osgood (Osgood, 1957) in order to measure the connotative meaning of cultural objects. Semantic differential scales are used in a variety of social science research but are also is used in marketing and practical, user-experience research and therapy. Sometimes semantic differentials are also known as polarities.

Content of index

Holbrook and Corfman (1984) list a set of word pairs to begin their description of the romantic and classic worldviews.

Table 6. Holbrook and Corfman's word-pairs

Classicist	Romantic		Logical	Emotional		Literal	Poetic
Controlled	Impulsive		Rational	Intuitive		Conservative	Unpredictable
Factual	Feelingful		Neat	Messy		Orderly	Disorderly
Precise	Vague		Restrained	Adventurous		Normal	Eccentric
Mechanical	Visionary		Disciplined	Intemperate		Clear-Headed	Moody
Organized	Chaotic		Punctilious	Slightly evil		Technical	Dreamy
Discreet	Chivalrous		Timid	Heroic		Scientific	Artistic
Practical	Impractical		Analytic	Holistic		Theoretic	Esthetic
Intellectual	Passionate		Masculine	Feminine		Definite	Mystical
Apollonian	Dionysian		Conventional	Individualistic		Confined	Transcendental
Familiar	Exotic		Drab	Colourful		Formal	Natural
Restricted	Spontaneous		Cultivated	Passionate		Reasonable	Sentimental
Mannered	Free						

Source: Holbrook and Corfman, 1984, p. 45.

In the survey that I used (see Appendix 1) the 55 RCI items included 28 romantic items (indicated by a + sign) and 27 classical items (–), respectively. (The + and – signs did not, of course, appear in the live version of the questionnaire but are added here for clarification.) A higher score reflects a higher level of romanticism. The ratings were scored from 1 to 7 (with reverse coding for the classical statements). A respondent's average numerical score is their RC Index, hence a score of 3.5 as a notional mid-point.

Gender differences

Because of a large variety of previous research, Holbrook expected to find significant gender differences in the application of the RCI; i.e. higher romanticism scores for women. His assumption was that this was because: "our cultural norms expect women to be relatively more artistic, intuitive, emotional, and unpredictable than men" (Holbrook, 1986, p. 342). All his research in this area showed a statistically significant higher romanticism score for women (Holbrook & Corfman, 1984; Holbrook, 1986; Holbrook & Onley, 1995; Holbrook, 1997). For example, in one study the results were that women "lean toward romanticism and men toward classicism ($t = 2.63$, $p < .005$)" (Holbrook & Onley, 1995, p. 218).

Confounding issues

Some questions in this survey involve instances where one answer might be seen as more socially acceptable than another – or rather one end of the Likert scale is more acceptable than the other. Examples are: "I am a practical person" (Question 3) and "Disorganization is a major

flaw" (Question 17). Very few people would be happy to be publicly labelled as impractical or disorganised. While it was reinforced to participants that this survey was anonymous, this kind of respondent bias is still a potential issue. Such biases are well known in social science literature (Silverman, 1993; Buchanan & Bryman, 2009). But in this case such effects are hopefully minimised by the sliding scale for scoring each question, the large number of questions and the anonymity of the results. Respondents do not have to say they are impractical but rather indicate that they are more one way or the other. Also, the way in which this survey was conducted – guaranteed anonymity, self-selection and conducted online – was designed to minimise the reluctance to provide socially unacceptable answers.

Also, some questions like "One should adopt a conservative lifestyle" (Question 1) seem somewhat out of date. Many people answering this question today would not separate the intent of the question from an association with conservative politics. The RCI remains a useful tool but it is about 30 years old and some of the wording needs modernising.

Survey content and delivery

I used the University of Tasmania Lime Survey system to construct and deliver the survey (http://www.utas.edu.au/it/web-services/utas-survey-tool). The survey instrument was constructed using this tool which then provided a web address that I was able to use to direct potential respondents to the survey. All respondents were guaranteed anonymity.

Sections A to C comprised 14 questions each from the RC Index. The questions were arranged this way (as opposed to smaller numbers of questions per page) to make them as quick as possible to complete. I was aware that completing a survey of nearly 60 questions could be prone to participants dropping out before completion. Section D was the last 13 questions of the RC Index.

I made the 55 questions of the RC Index compulsory for participants to fill out. However, the remaining questions were not compulsory. These were:

- What do you think are the main factors for some people's reluctance to eat genetically modified food?
- What do you think are the potential environmental impacts of genetically modified crops?

The aim was to get the RC Index for each participant and then to have text from these open questions to analyse as well.

These were followed by three demographic questions asking participants their gender, the year they were born and the length of time they had been a supporter of the anti-GM movement.

Administering the survey scale

On 1 February 2014 I posted a link to my survey on 16 anti-GM Facebook pages. These pages were selected by using the search function in Facebook combining the search term "Australia" with "GMO", "Monsanto" and "genetically". While "GMO" is a common term in the USA, Australia and Europe tend to use other terms, hence the addition of "genetically". Some anti-GM Facebook sites are linked to the "March Against Monsanto" sub-group of the movement. I

narrowed the pages to ones based in Australia. This gave me enough potential respondents, a relatively homogenous sample, and someone posting a request to complete a survey from an Australian university would be less likely to meet with resistance than if the Facebook page was based elsewhere.

The combined search results provided 16 Facebook pages, listed in Table 7, whose primary focus is to oppose GM food in Australia directly, five opposed to Monsanto, and one that opposed fluoridation and Monsanto, and were based in Australia.

For each Facebook page I sent a message via Facebook to the moderator of the page asking permission to post a request on their page, explaining what the survey was for and providing a link to it on a UTAS server. Three asked further questions to ensure that this project was university-approved research but all granted permission. My post to the Facebook pages explained who I was, what the survey was about, what the data would be used for and provided a link to the survey. These issues were spelled out in full on the cover page of the survey (as per the text included in the UTAS ethics approval).

A reminder was posted on each Facebook page on 2 March. Upon closing the survey towards the end of March I had 53 completed surveys. No additional data was collected after 1 April 2014.

Limitations

The RC Index has only been used by a small number of researchers and principally for marketing research. The broad range of sources from which it was compiled and the validation provided confidence that to a reasonable degree it measures what it aims to measure and is reliable and valid. However, the limited number of uses of this index and the very small number of scores publicly available mean that it is difficult to know where this sample fits with respect to others.

A score on a survey instrument like this can do no more than give the broadest indication of where a particular person might fit on the romanticism–classicism spectrum.

The self-selection of participants should mean a bias in the sample towards those supporters of the target Facebook pages who are the most committed and interested in the topic. This is an assumption that is impossible to prove but I think is quite likely. This assumption may be somewhat supported by the participant's long years of involvement in this campaign as evidenced in the demographic information. However, this bias is useful in this instance since the purpose here is to obtain the views of participants who are committed to the anti-GMO cause.

Romanticism is very difficult to define and hence not an easy concept to prove or quantify. I cannot hope to *conclusively* answer my research question with the tools and data I have at hand. The best I can hope for is a relatively convincing indication that romanticism could be a contributing factor to anti-GM sentiment, as exhibited by what I have learned from these participants. The RCI score for each individual is a somewhat blunt instrument but in the context of this research it is a useful tool. If, for example, the cohort scores highly on the romanticism end of this scale, future research could move on to examining specific expressions of romanticism in that group. The RCI score for this cohort could give a broad indication of

their degree of romanticism. The questions on the scale also give an additional indication of the kinds of issues to look for when analysing the statements in the open questions. Looking at the word pairs that are components of this index provides pointers to analysing the open questions.

Table 7. List of anti-GM Facebook pages where a link to the survey was posted.

Name	URL	No. of "Likes" as at Jan 2014
Australia Get To Know The History Of GMO - Our Future Depends On It	https://www.facebook.com/australiagmo	213
Australia Organics, No-GMO	https://www.facebook.com/pages/Australia-Organics-No-GMO/403976052969015?fref=ts	63
Australians against Monsanto.	https://www.facebook.com/pages/Australians-against-Monsanto/621859317844172?fref=ts	56
Australians Want GM Free Food	https://www.facebook.com/AustraliansWantGMFreeFood?fref=ts	2,216
Ban GMO's Australia	https://www.facebook.com/BanGmosAustralia?fref=ts	96
Ban Monsanto GMO's Poisons and Fluoride in Australia.	https://www.facebook.com/Plantzzz?fref=ts	100
Genetically Modified (GM) Foods Watchgroup of Australia	https://www.facebook.com/G.MFoodsWatchgroupAustralia	458
GMO Free Australia	https://www.facebook.com/GMOFreeAus?fref=ts	1,735
Keep Tasmania GMO Free	https://www.facebook.com/KeepTasmaniaGmoFree?fref=ts	1,989
March Against Monsanto – Australia	https://www.facebook.com/MarchAgainstMonsantoAustralia?fref=ts	712
Marching Against Monsanto - Australia Info Page	https://www.facebook.com/MarchingAgainstMonsantoAustraliaInfoPage?fref=ts	86
Monsanto free Australia	https://www.facebook.com/groups/432015913549338/?fref=ts	1938
Monsanto out of Australia	https://www.facebook.com/pages/Monsanto-out-of-Australia/121991401218641?fref=ts	517
NO GMO Australia	https://www.facebook.com/pages/No-gmo-australia/112752915524316?fref=ts	135
Say NO to G.M.O. Australia	https://www.facebook.com/SayNoToGmoAustralia?fref=ts	48
Australia Bans GMO	https://www.facebook.com/AustraliaBansGmo?fref=ts	860

Chapter 4: Results and Discussion

The purpose of this chapter is to analyse and discuss the outcomes of the survey I conducted of supporters of anti-GM Facebook pages. The RCI scores for this cohort will be examined and patterns in the answers to individual questions will be discussed. The open questions will be analysed through comparison with the list of key characteristics of romanticism listed at the end of Chapter 2.

Survey results

The study received 83 returned surveys of which 53 were fully completed. As the survey included over 60 questions and took about 15 minutes to complete, and was requested by a link on Facebook pages, 53 completed surveys was a pleasing result. I have only included in the analysis returned surveys that answered all the RCI questions and added at least something in the two open questions.

Demographic data on respondents

The respondents included 8 males and 45 females. The average age was 47. The oldest person was 70 and the youngest was 22.

Precisely half of the respondents said they had 2 years or more involvement with the anti-GM movement, with 5 in the 6–12 months category and 13 for 1–2 years. The fact about half the respondents have been active on this issue for 2 years or more supports the assumption that those most likely to respond to the request to complete the survey, and to answer all the questions, would be likely to be long term activists committed to this issue.

Table 8. How long have you been a supporter of the anti-GM food movement?

Answer	Count	Percentage
Less than 6 months	0	0.0%
6–12 months	5	9.4%
1 to 2 years	13	24.5%
More than 2 years	26	49.0%
Not sure	4	7.5%
No answer	5	9.4%

RC score

Evaluating a person's score on the Romanticism–Classicism Index begins with converting answers to numbers. The 7-point Likert Scale questions are valued 1 – 7 or 7 – 1 depending if they are romanticism or classicism questions. A person's answers to the 55 questions are totalled and then divided by 55 to give an average score out of 7.

Table 9. How the questions were scored

	Strongly Agree	Agree	Somewhat Agree	Neither Agree nor Disagree	Somewhat Disagree	Disagree	Strongly Disagree	Can't choose
Classicism questions (–)	1	2	3	4	5	6	7	0
Romanticism questions (+)	7	6	5	4	3	2	1	0

The average RC score for this group was 4.39. The median score is 4.42. Individual scores ranged from 5.29 (high in romanticism) to 3.38 (approximately neutral). The average score is at the high romanticism end of the spectrum compared to other published uses of this index, for example, in the work by Kruiff, Nairn and Berthon.

Jasper Kruiff divided his sample of 195 participants into two groups based on a dominance–sensuality index. By applying the RC Index to these two groups he gained scores of 2.83 to 3.68 from the "dominant" and 3.12–3.75 for the "sensual" group (Kruiff, 2011), where the "sensual" group was expected to be at the romanticism end of the scale.

Nairn and Berthon conducted a study of 201 UK university students in which they were shown different kinds of holiday advertising and divided into three groups: control, romantic and classicist. The results for applying the RC Index were control = 4.277, romantic = 4.428 and classicist 4.235 (Nairn & Berthon, 2003).

Given the above results of other studies using this index, a median score of 4.42 can be considered a significantly high romanticism score. However, because of the lack of studies applying this index to a broad spectrum of the population, the relationship between this group and the population average still remains unclear.

A useful way to analyse the answers to the RC Index is to look at the answers overall, and look at which questions were on average scored highest and lowest.

Table 10. RC Index scores of 53 completed surveys

3.38	3.44	3.53	3.55	3.60	3.87
3.89	3.89	3.95	3.98	4.07	4.09
4.09	4.15	4.16	4.20	4.29	4.33
4.35	4.35	4.38	4.38	4.38	4.38
4.38	4.40	4.42	4.47	4.47	4.47
4.47	4.51	4.53	4.56	4.58	4.60
4.60	4.62	4.65	4.67	4.67	4.69
4.69	4.73	4.78	4.80	4.82	4.84
4.96	5.06	5.16	5.27	5.29	

The table below lists the five average highest answers in the RC Index questions.

Table 11. The 5 highest scoring answers in the RC Index

Question number	Average score	Question
20	5.45	I am not an emotional person. –
19	5.20	Paintings should attempt to represent their subjects with maximum realism. –
1	4.91	One should adopt a conservative lifestyle. –
15	4.91	Sometimes evil is consistent with greatness. +
40	4.56	A nice home is always neat and orderly. –

Question 20: "I am not an emotional person."
According to Carl Schmitt: "The content of subjective emotional life determines what is real" (Schmitt, 1919, p. 19). Feeling and emotions are so central to Romanticism. This topic overlaps with the burgeoning study of the emotions in sociology and other disciplines. For example, Faflak and Shia's recent book on *Romanticism and the Emotions* puts forward the idea that emotion is the main means by which romantics understand the world and express what is important to them (Faflak & Sha, 2014). Given the centrality of emotion in romanticism, this high score for question 20 is to be expected if the research hypothesis is correct.

Question 19: "Paintings should attempt to represent their subjects with maximum realism."
"Realism" is one of the core values of classicism. In his commentary on *Realism and Romanticism in Sociology*, Alan Wolfe put it very simply: realism seeks to describe the world as it is, not as the observer of that world wants it to be (Wolfe, 1995). As a style of literature, realism grew at the end of the 19th century as a reaction to the romances, nature poetry and gothic novels of romanticism (Wellek, 1961). This question as expected elicited a strong romantic reaction.

Question 1: "One should adopt a conservative lifestyle."
A "conservative lifestyle" is a summary of all that is not romanticism. According to Sebald, the counterculture movements of the 1960s and 1970s metamorphosed into the New Age movement of the 1980s, with its "distrust of science, objectivity and realism" (Sebald, 2015, p. 106) The anti-materialist style of these movements signifies "itself in dress, diet, housing, transportation and other necessities of life" (Sebald, 2015, p. 109). Even the 'untidiness' of organic farming has been contrasted to the orderly aesthetic of traditional farming landscapes (Egoz, Bowring, & Perkins, 2006). This contrast of order/chaos and formality/informality is one of the key fault lines between romanticism and classicism. At a score of almost five, this was the third highest average score in this survey. Although I think the wording of this question needs updating it evoked a high romantic response.

Question 15: "Sometimes evil is consistent with greatness."
As a romanticism question this one did not work with this group the way it was designed. The literature relating to the development of the R–C Index does not provide justification for the use of any particular question. In my view this question seeks to probe the fascination of romanticism with heroes, as well as its apolitical nature. However, I think it is very unlikely to elicit an honest answer if someone does agree with it. As Staudenmaier puts it, political romanticism is a kind of free-floating sense of ill-ease and disaffection that "can, in times of

crisis, yield barbaric results" (Staudenmaier, 1995, p. 9). What this means is that there have been romanticised supporters of fascist movements and the far left, supporters of witch-hunts and revolutions. Because of the age of this survey, it is unlikely that a contemporary audience would interpret this question the way it was intended. The score for this question was at the opposite end of the spectrum to what was expected. For future use of this survey this question needs to be rewritten or deleted.

Question 40: "A nice home is always neat and orderly."
This is quite close to the intention of question 1. The orderly conservative rationality of capitalism is contrasted with the rebellious and emotional confusion of romanticism. According to Nemoianu, romanticism replaces the "rational, dry Creator ('the Great Clockmaker') with "a much more disorderly ('wild and woolly') Being" (Nemoianu, 2005, p. 393). The score for this question was 4.56 which was high on the romanticism end of the spectrum as expected.

With the exception of question 15, the responses on the whole are consistent with romanticism.

Gender difference

As cited by Tranter (Tranter, 2011, p. 80) several studies have found that women take a greater interest in environmental issues and are more likely to actively participate in environmental organisations. This is consistent with the results of the survey returned from 45 women and 8 men. The average female score was 4.36 and 4.18 for men.

Several previous applications of the RCI showed a significant gender difference in scores; with females exhibiting significantly higher romanticism scores (Holbrook, 1985; Holbrook & Onley, 1995; Nairn & Berthon, 2003; Nairn & Berthon, 2005).

A statistical t-test calculates the significance of whether or not the difference between two groups' averages most likely reflects a "real" difference in the population from which the groups were sampled.

Table 12. RC Index scores by gender

Total Participants	53
Average RC Score	4.34
Total Females	47
Average Female RC Score	4.36
Total Males	8
Average Male RC Score	4.18

The statistical analysis of the results in Table 13 reveals that there is only about a one in four chance that this outcome occurred randomly. This result confirms previous results of higher romanticism scores for women. However, it is worth noting that if this is the case it is possible that the overall average scores have been skewed by the very high proportion of women respondents. [It is, of course, also possible that the higher preponderance of romantic thinking

among women makes them more likely to join the anti-GM movement but this will have to be pursued in further research].

Table 13. t-test for significance in male/female scores

Variance	Variance female	Variance male
0.218999026	0.18817737	0.365490702
SD total	**SD Female**	**SD male**
0.472451633	0.43869594	0.646299977
t-Test: Two-Sample Assuming Unequal Variances		
Mean	4.362020202	4.184090909
Variance	0.192454128	0.41770366
Observations	45.0	8
Hypothesized Mean Difference	0	
df	8.0	
t Stat	0.748622296	
P(T<=t) one-tail	0.237758207	
t Critical one-tail	1.859548038	
P(T<=t) two-tail	0.475516415	
t Critical two-tail	2.306004135	

Summary of RCI

The individual scores for this Index, as well as the overall averaged scores for the various questions, are well into the romanticism end of the spectrum and high compared to other uses of the scale, as mentioned above. The results were also consistent with the previously established pattern of higher romanticism scores for women over men.

As argued in Chapter 2, there is considerable body of literature which suggests that romanticism is a widely held and influential worldview in the 21st century which has significant impacts on human behaviour including attitudes towards food and the environment movement. The survey results are consistent with the experimental question – that activists involved in anti-GM movement activity are likely to be influenced by a romantic worldview.

The next section deals with participants' responses to the two open questions dealing with their views on GM food. The statements provided by participants are compared with the list of the attributes of romanticism listed at the end of Chapter 2 to determine the extent to which these statements correspond with a romantic view of the world.

Analysis of open survey questions

The two open questions following the RCI were:

- What do you think are the main factors for some people's reluctance to eat genetically modified food?
- What do you think are the potential environmental impacts of genetically modified crops?

These questions were added so that respondents could put in their own words what they thought were the main problems with genetically modified food. The two questions are similar but the intention was to tease out attitudes on a political or social level with the first question and specific environmental concerns with the second. As it turned out the overall answers to these questions were so similar that there was no reason treat them separately for this analysis. Hence the answers to both questions have been dealt with as one data source. [See Appendix 2 for the full text of respondents' answers.]

Content analysis has been defined as a systematic and replicable technique for compressing a body of text into categories based on explicit rules of coding (Stemler, 2001). Taken as a whole, the responses to the open-ended questions totalled 2,500 words. Since the survey participants were responding to questions about why they opposed GM food it seemed logical to code the text according to the categories of reasons given. As expected the answers supplied covered the range of anti-GM movement claims.

Many answers were a list of points and these have been separated where they refer to distinct issues. Managing the data in this way produced 210 discrete statements. After reading the text several times the following 11 categories seemed to summarise the content.

Table 14. Coding and frequency

Code	Code explanation	Frequency
H	Human health	47
E	Environmental health	45
F	Fear of corporate control of food production	22
N	Natural/nature	22
U	Unknown consequences	22
C	Concern over GM crops contaminating non-GM crops, especially organics	20
I	Insufficient independent scientific testing	13
B	GM crops kill bees and other useful insects	9
O	Other	5
M	Monoculture	3
L	GM must be labelled	2

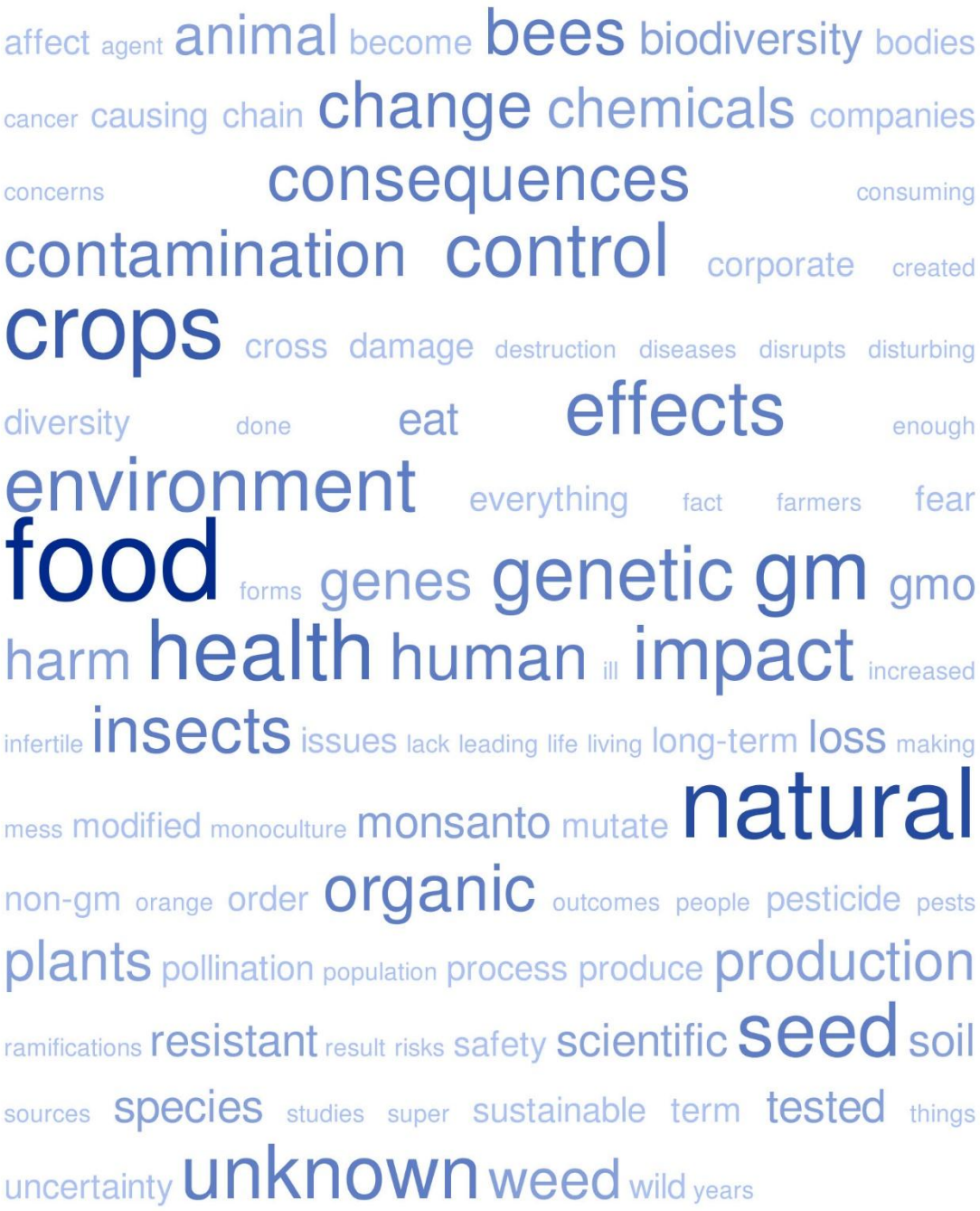

Figure 3. Word cloud showing most frequently used words. (Generated by using http://worditout.com/.)

The word cloud is a simple visual representation of the most commonly used terms in the text with their relative frequency indicated by the size of the type. The words that are most prominent here are “bees”, “chemicals”, “consequences”, “contamination”, “control”, “human health”, “natural”, “organic” and “unknown”. This neatly summarises what this cohort thought were the main issues with GM food and in my view summarises to a large extent what the wider movement thinks about this issue as well: that genetic modification is not natural and is potentially hazardous to human health and the environment, that it strengthens the hand of a few

multinationals to control world crop production and can contaminate non-GM crops and other species.

All the quotes below (unless otherwise stated) are from the answers to the open survey questions listed in Appendix 2.

Human health

One of the common reactions to the rise of capitalism in the 19th century was to recoil from its effects on human health; the factory working conditions; squalid living conditions in towns and cities; pollution and poor diet (Engels, 1845; Thompson, 1993). This strain of criticism was reborn in the mid-twentieth century with Rachel Carson's *Silent Spring* and the rise of the environment movement. The response of the left and liberals in that movement was predominantly for more or better regulation (Bernstein, 2001). The Environment Protection Agency was created in the USA at this time[26]. Bernstein's book cited above is about the compromises liberals and the left make to ensure some environmental protection. Romantics are far less willing to compromise with capitalism. Rather they reject it as a source of disenchantment, sickness and environmental harm (Lowy & Sayre, 2001).

In the answers to the open survey questions there were 47 mentions of actual or potential impacts on human health from GM food. The answers in this category reflect participants' sense of alarm about the health impacts of genetically modified food. Responses described GM products are "cancer causing" (2 mentions), or "increase your chances of cancer". Some researchers see disease and the body as "the master trope of the Romantic period" (Ahern, 2005, p. 69). Some of the key characteristics of romanticism such as concern with the self, introspection and emotionality, lead to a focus on the physical impacts of the world on the body (Wallen, 2004). "The Romantics inherited a way of thinking through the body that emphasized pathology more than equilibrium, and that valued the display of high-strung sensitivity – even to the point of hypochondria – as a mark of cultural distinction," (Ahern, 2005, p. 70). The degree of concern aroused by GMOs for those with romanticism seems to pull in all other issues. Genetic modification is such a 'bad idea' that it *must* be responsible for cancer. The other key factor here is trust. Anti-GM activists don't believe scientists when they say there are no health impacts from GMOs.

One of the most common categories of genetic modification is to add the genes that produce the *Bt* toxin, a naturally occurring insecticide. *Bt* is considered so safe for humans and 'natural' that it can be sprayed on organic crops[27]. Some comments in the survey included: "wildlife may be harmed by new toxins", the single word "toxins", and "food laced with pesticide". GMOs are also described as "toxic frankenfurter food" and "GMO food is toxic". The natural/unnatural dualism is one of the key drivers of romantic emotional response to GMOs. In the context of organic farming, spraying crops with *Bt* insecticide is not questioned, even though not only moths and butterflies are killed but also non-target insects. But when scientists insert a gene in an organism it immediately becomes unnatural and hazardous.

26 December 2, 1970 (http://www2.epa.gov/aboutepa/epa-history).

27 http://www.groworganic.com/weed-pest-control/organic-pest-control/organic-pesticide.html

One response said that GM food could produce "new diseases". Another wondered whether a "change" in our food could "change" us. One response alleged that "Americans are much sicker than they were years ago" and if "over 80% or their food is genetically modified I am not surprised." Because romantic consumers do not trust science and government agencies, they seek out 'alternative' sources of information. The website of Chris Dresser, who wears a white coat in the photo the website's masthead[28], offers the advice that GMOs "*could* play a role in the recent dramatic rise in obesity, diabetes, allergies, autoimmune disease and infertility in our country."[29]

The vast majority of the mentions of human health issues are not specific (e.g. "ill health"; animal and human health risks including infertility; "terrible side-effects"). Some quotes that are more closely related to romantic themes about Nature are: "disturbing the natural order and balance" which may lead to "potentially harmful consequences for our bodies and our world"; "processed and some 'fresh' foods cause health issues as do GM foods"; and "it will mutate human genes leading to the end of the human race." This language reflects an end-of-the-world apocalypticism that is typical of romanticism (Stevens, 2004).

Environmental health

Romanticism sees nature as something pure that should be beyond the corruptibility of human beings (D. E. Smith, 2013). While farmers engaging in selective breeding is seen as 'natural' and part of a bucolic, organic landscape, altering genes is seen as introducing something external, foreign and corrupting into the environment.

Statements around environmental health included that GMOs were becoming weeds or crossing with other weeds – this rated 7 mentions (e.g. "mutation of super weeds", "escape into the environment creating super weeds"). Other environmental threats mentioned in the survey answers focussed on GM crops leading to decreased biodiversity (6 mentions): ("crossing over to other species), destruction of the food chain (4 mentions); contamination of non-GM crops or bushland (14 mentions). Others mentioned potential impacts on a range of flora and fauna and comparisons to the introduction of cane toads in Australia.

Hutchings in his work on green romanticism traced the meshing of ideas about the feminine "Nature" and fending off the advances of masculine industry and science; moral purity and ecological purity woven together (Hutchings, 2007). Nature is 'pure' and perfect and cannot be improved upon by man-made systems. One of the respondents says: "it is not the way nature intended and you don't mess with Mother Nature." From the late 1980s Greenpeace "has opposed the release of any GMOs as 'genetic pollution' " (Levidow, 2000, p. 328). Levidow continues: "risk implies a moral transgression as well as biophysical harm." If 'mad scientists' 'mess with Mother Nature' the assumption is that grave consequences are implied.

28 The "About" page of this website says that Mr Dresser is "M.S., Lac". In the US context "M.S." refers to a Master of Science. L.Ac. means Licenced Acupuncturist.

29 http://chriskresser.com/are-gmos-safe/

Fear of corporate control

In the same way that romantic consumers seek to buy products that 're-enchant' their world (organic, fair trade), some choose to 'escape' capitalism by setting up their own small businesses, engaging in organic farming, barter, involvement in the art/craft industry, alternative energy and other 'sustainable' business models (North, 2015). But big companies or multinationals are the ugly face of capitalism.

The words "control" (15 mentions), "corporate" (3 mentions) and "multinational" (1) all appear as a pure expression of romantic anti-capitalism. GM food is "corporate controlled", "don't believe the corporate speak about its harmlessness", and "large companies holding too much control over what is grown and availability of seed."

These statements closely correspond with a desire to take agriculture back to a pre-capitalist mode.

Natural/nature

A deep and sublime connection with nature is probably the most important theme in romanticism. "By the eighteenth century this sense of the wilderness as a landscape where the supernatural lay just beneath the surface was expressed in the doctrine of the sublime (Cronon, 1995, p. 4). The word "natural" appears 19 times in the answers. Most of the answers in the Nature/Natural category were quite short, along the lines of: "It's not natural.", "Dislike of unnatural food", and "Disrupts the natural order of things". Three answers consisted of "not natural." Comments about "the natural order" reflect the semi-religious way that many with a romantic worldview see the natural world. One respondent put quotation marks around these words "natural form of things."

Another went into more detail: "The earth was created as a sustainable living miracle so why mess with such intricate beauty and productivity." In one short sentence this statement reflects the anti-reductionist sentiment of romanticism (that the world was created as it is and we shouldn't tamper with it), the strong religious overtones in some expressions of romanticism, and notions of Nature as sublime and inviolate.

These statements portray a classic romantic view of the natural world: that it was created by a higher being or is itself and is often thought of as a single living entity (Gaia); that it is perfect and any contact with humanity can only corrupt.

What the scholarship in Chapter 2 about romanticism indicates is that "natural" is the totem word which symbolises the opposition of romanticism to the enlightenment, many forms of science and to capitalism. When science examines an object, changes it and creates a new entity that can then be commodified, this is antithetical to romanticism.

Attack of the bee killers

"Bees" are specifically mentioned 12 times and "insects" 14 times. Examples are: "death of important insects such as bees", "Death of bees", "Damage to insects, especially bees", "The impact it's had on the bee population", and "A lot of GM foods are destroying pollinating insects!"

To provide some context for these quotes, among the most common categories of GM crops are those that have genes added to them to produce the *Bt* insecticide [see Glossary]. Hence, from the early stages of this debate one area of attack on the GM industry was to say that if it repelled or killed insects then it would kill beneficial or non-target insects and that humans would eat the *Bt* toxin and be impacted by it. Another insect, Monarch butterflies, has been linked to GM crops since an article in *Nature* in 1999. Although this research was later refuted (Fecht, 2013), many anti-GM websites raise the issue of *Bt* GM crops killing non-target insects. Both scientists and beekeepers refute the link between GM crops and the recent decline in bee populations.[30]

But as with other issues in the quotes mentioned above, lack of causation does not trouble the romantic opponents of GM food. News reports of "Colony Collapse Disorder" were attributed by entomologists and the United States Department of Agriculture (USDA) to viruses, fungi, and as part of a cyclical change in bee numbers reported in the 1880s, 1920s and 1960s.[31] Because bee decline was a regularly mentioned news issue with imprecise causes it was associated with GM crops on activist websites.

Monoculture

Two instances in the survey are the single word "monoculture", and the other is "dislike monoculture" as reasons for their opposition to GM food. "Monoculture" here is a surrogate term for corporate farming. Again there is no direct connection with genetic modification technology but those with a romantic worldview seem to attach everything they see as wrong with agriculture and food with GMOs. As monoculture is a surrogate term for corporate farming, so GM is a surrogate for the disenchanting intervention of science into food and nature.

Another reason for the prominence of the "monoculture" trope is that this has been taken up by Indian anti-GM campaigner, Vandana Shiva. As in her book, *Monocultures of the Mind* (Shiva, 1993a), she equates commercial agriculture with monoculture which erases the diversity of tradition Indian agriculture. Couching her thesis in anti-colonial and feminist terms her work is very widely read amongst anti-GM activists and she has received many awards for her work[32]. According to Cochrane, as a highly regarded subsistence ecofeminist, Shiva attempts to make the case "that much of what is thought to be rural poverty is not poverty at all, but simply manifestations of culturally 'other' forms of 'difference'." Shiva is extremely widely read in the

30 [For an interesting and comprehensive article on bees and GM see the Scientific Beekeeping website, http://scientificbeekeeping.com/sick-bees-part-18e-colony-collapse-revisited-genetically-modified-plants/#practicality-overrides-principle].

31 USDA report on Colony Collapse Disorder (http://www.ars.usda.gov/News/docs.htm?docid=15572).

32 In 1993, Shiva received the Right Livelihood Award, often called the alternative Nobel Prize, for her activism on behalf of ecology and women. Time, the Guardian, Forbes, and Asia Week have all placed her on lists of the world's most important activists. Shiva, who holds a Ph.D. in philosophy from the University of Western Ontario, has received honorary doctorates from universities in Paris, Oslo, and Toronto, among others. In 2010, she was awarded the Sydney Peace Prize for her commitment to social justice and her tireless efforts on behalf of the poor. Earlier this year, Beloit College, in Wisconsin, honoured Shiva with its Weissberg Chair in International Studies, calling her "a one-woman movement for peace, sustainability, and social justice" (Specter, 2014).

anti-GM movement. "*Time* magazine called her an "environmental hero" in 2003 and *Forbes* magazine identified her as one of the Seven Most Powerful Feminists on the Globe in 2010."[33]

Unknown

As a catch-all, to say that GMOs can have unknown consequences in the future plays on the anxiety produced by previous failures of science and industry to prevent disasters like thalidomide and DDT. It is an aspect of the "precautionary principle" advocated by some green groups which aims to block innovation where there are no absolute guarantees of long-term safety. This 'principle' is not static but the result of constant contestation, "the messy and complex interactions that make up the environmental policy process" (Hajer & Versteeg, 2005, p. 176). "Unknown" is mentioned 14 times, most linked to health or environmental impacts (e.g. "fear of unknown impacts of modified genes on human health" and "unknown long-term effects on the human body and on the environment").

The answer in this category, "Our [political] system won't handle the problems associated with GMO products in the future" reveals a significant lack of trust in governments and state bodies that regulate agricultural production and food. The conspiratorial aspect of romanticism is revealed in "Who knows what they will put in or 'change' in our food to 'change' us." The "they" here is most likely a reference to Monsanto and the other 7–8 multinationals who dominate the GM seed industry. Distrust of authority and the opposition to capitalism in the name of pre-capitalist values are expressed here. All large companies are assumed to be corrupt and the involvement of them in food production can only be retrograde. " 'Natural' foods are seen to be of an inherently higher standard than industrial foods …. While the former are thought to embody nature's natural safeguards against disease and illness, the latter are seen as compromised by the processes of 'appropriationism' and 'substitutionism' that progressively render nature so pliable" (Murdoch & Miele, 1999, p. 469).

To say there could be unknown health or environmental problems down the track with GMOs is to reveal a person's emotional response to this technology. It reveals an unease and revulsion to genetic engineering tampering with nature. GM scientists or Monsanto would say that once a GM product is created, it is a plant like any other. It is no more likely to mutate or 'exchange' genetic material than any other plant. But for romantics these will always remain un-natural.

"Other"

After coding the answers to the open questions, a number of answers fell outside the 12 specific categories. One particularly revealing answer to the question "What do you think are the main factors for some people's reluctance to eat genetically modified food?" is "The ick factor." This is a particularly clear example of the recoiling from GM that is characteristic of a romantic view of the world. This short statement sums up the visceral, emotional reaction that romantics have to the *idea* of genetic modification.

33 http://www.forbes.com/sites/jonentine/2014/01/29/vandana-shiva-anti-gmo-celebrity-eco-goddess-or-dangerous-fabulist/

Conclusion

The statements made in the open questions of the survey appear to support the suggestion that the respondents are considerably influenced by romanticism. The frequent use of "natural" and "unnatural", nature as a sacred being invaded and violated by science, and the evil spectre of multinational corporations (a gothic anti-capitalism) support this contention. In this highly charged emotional state, a range of problems are blamed on GM food: cancer, bee decline, monoculture, destruction of the food chain, super-resistant bugs and weeds, genes passing from GMOs to other plants and humans and the capacity to "change" our very being. And changing human beings is what's at stake here. Not physically change but the two opposing futures offered by scientism and romanticism – a brave new world where plant and animal characteristics can be 'programmed' at will, or romantic nostalgia for a simpler life more in touch with nature. While a preferred outcome might be to have the direction of scientific research, and its outcomes in new technology, guided by informed debate, I have no suggestions as to how that might come about.

Chapter 5: Conclusion

I have attempted to show that the underlying motivation for many in the anti-GM movement is the worldview of romanticism. Today in the USA this issue is fought with the same virulence as other aspects of politics. Insults are traded, freedom of information requests are lodged to 'expose' malfeasance, and the political system has been used with many states voting on plebiscites over GMO labelling.[34]

As discussed by Nairn and Berthon (Nairn & Berthon, 2003), a person's behaviour can be driven by a wide variety of social and personal motivations and personality is more complex that just facets of romanticism and classicism. However, in the case of the anti-GM movement, there are a complex set of behaviour patterns that are consistent across time and space. From the early outpourings of opposition to the rise of capitalism in the nineteenth century in literature, art, philosophy and politics, to the ramblers and back-to-nature movement of the 1920s, through to the social movement of the 1960s, New Age in the 1980s and in recent times in the emotion-laden opposition to genetic modification of food, a very similar pattern of behaviours has occurred.

The introduction began with a description of a raid by Greenpeace on a CSIRO greenhouse near Canberra that was growing experimental GM wheat. The carrying out of an illegal action to prevent the scientific testing of a GM crop created headlines in Australia and brought to the surface and issue that had been very quiet in this country for some time. In Australia there is a government regulatory body in place, the Office of the Gene Technology Regulator, and CSIRO was doing its best to work within that policy framework. But Greenpeace activists were willing to risk imprisonment to stop it.

According to the long list of scientific organisations quoted here, there is no problem with GM food. The millions of farmers growing GM crops[35] do so because they make a slightly higher profit than by growing non-GM. Despite trillions of meals of GM food being consumed and no health or environmental problems over a 30-year period, why does the anti-GM movement still exist; why does it refer to "Seeds of Evil", "Monsatan" and "Frankenfood"? Anti-GM activist groups are certain they are right, vocally and emotionally demand to be heard, and resist state or other control. They have outlier research to point to. Even if there are only one or two studies of dubious validity, this is enough to raise doubt, especially in the minds of people who are predisposed in that direction. The validity of the scientific consensus is attacked and its successes downplayed. The honesty and integrity of majority-view scientists are called into question. They must be in the pay of this or that dark corporate–government cabal. Then there are calls to higher authorities than science: it is not "natural", it is against god's law; they are

34 "I've been FOIAed": Alison Van Eenennaam on being in crosshairs of anti-GMO activists", Genetic Literacy Project, 10 September 2015, http://www.geneticliteracyproject.org/2015/09/10/ive-been-foia-ed-alison-van-eenennaam-on-being-in-crosshairs-of-anti-gmo-activists/

35 See figures provided by the International Service for the Acquisition of Agri-biotech Applications: http://www.cardiff.ac.uk/socsi/contactsandpeople/harrycollins/science-wars.html

playing god; we didn't have problems with cancer and strange diseases back in the good old days and GM is the cause.

Chapter 1 outlined what genetic modification is and briefly traced the history of its development and that of the anti-GM movement. This is not a classic social movement where claims are made, the target of the movement either responds in some way or not, and the movement then responds. Instead there is a movement to and fro, a competition for public attention and support. But what seems to be the case here is that despite the food production sector in large parts of the world getting on with creating these products and having them consumed on an ever-increasing scale, the anti-GM movement has kept on saying the same things its always has – that there are potential health and environmental impacts.

Chapter 2 went into some detail to show that romanticism is a commonly held worldview, and has been so throughout much of written human history. With the rise of capitalism there was a resurgent expression of it in politics, literature, philosophy and art. A thread of continuity was drawn from that time to the present and the relationship of romanticism with science, food and nature were examined. The summary at the end of that chapter listed a number of key aspects of romanticism.

I developed a survey that incorporated an index to measure someone's position on the romanticism-classicism spectrum. Although this cannot be considered a precision instrument, it provided an opportunity to both give a general assessment of my target audience (supporters of anti-GM Facebook pages) and looking at the pattern of answers provided some further insights supporting my hypothesis. The open questions asking respondents for their reasons for opposing genetically modified food provided considerable evidence of romanticism: many responses were emotional, Manichean, opposing capitalism while preferring pre-capitalist forms agriculture free of 'corporate control', a kind of anti-modern attitude to science and technology such that many of the West's health issues were assumed to be caused by GM food.

The romanticism expressed by Vandana Shiva is more alarming that the Western version. The anti-GM movement in Australia, the USA and Europe can choose to oppose GM food and mass produced food in general. We have access to organic food in supermarkets, we have farmers' markets and other alternatives. What Shiva is saying to dirt poor Indian farmers is 'don't grow commercial crops, stay subsistence farmers, this is sustainable and all poverty is relative.

Creating a grievance

Most protest movements are a response to a material situation: opposing a war, advocating for the rights of the disabled, saving rainforest from imminent destruction. The curious nature of the anti-GMO movement is that it is more like a moral panic[36] than a classic protest movement. It was initiated and sustained by fear. In the words of Schurman and Munro they had to "create a grievance" (Schurman & Munro, 2006, p. 32).

36 See Glossary.

Monsanto presented itself as the perfect candidate for a folk devil[37]. The movement having developed a sense of fear about a technology that few people understood, having created the dual folk devils of 'Frankenfood' and 'Monsatan', with some help from a few like-minded researchers casting doubt on the safety of GM food, this collection of fear and symbols has proved to be powerful and long-lasting. While romanticism, and a healthy scepticism about capitalism and technology, has provided a large receptive audience for this fear and symbology, another boost has come from the complete inability of the GM industry to engage in an open and transparent way with people who are hesitant about their products.

Figure 4. Website: Common Dreams – Breaking News & Views for the Progressive Community
http://www.commondreams.org/further/2013/04/10/undue-influence-monsanto-protection-act-just-tip-genetically-engineered-iceberg
Accessed 28/12/2014

Figure 5. Website: ChemTrails.net
http://chemtrailsplanet.net/2014/04/24/monsanto-owns-the-weather-in-1billion-purchase-of-climate-corporation/
Accessed 28/12/2014

Figure 6. Website: Now The End Begins.com "The magazine of record for the last days."
http://www.nowtheendbegins.com/blog/?p=13539
Accessed 28/12/2014

Figure 7. Website: Greenpeace. Caption: Monsanto's GMO corn threatens biodiversity.
http://www.greenpeace.org/international/en/multimedia/photos/corn-grenade-the-winning-imag/
Accessed: 28/12/2014

37 See Glossary.

A key aspect of anti-GM discourse is anti-capitalist rhetoric. Monoculture, corporate farming, multinationals and control of the international seed market all feature widely in attacks on GM food. Monsanto provides such as useful target for outrage that to some extent it has pushed GM food into the background. A large segment of the movement is focussed on 'March Against Monsanto'. It is about this particular company having more power and influence that motivates many activists. Having an 'evil' villain to focus on appears to have been a useful vehicle for the movement.

Need for refinement and large-scale application of RCI

As I have shown, romanticism (and scientism) are important motivating factors in human behaviour and have a huge impact on the way we live. It would therefore be of considerable use to have a reliable and well-tested measure for these worldviews. The RC Index is hampered by some questions which are badly worded and others which need updating. I think it would be a very useful piece of research to make these improvements and then use this index on a larger audience to gain a 'base reading' for a general population.

Binary worldviews and complex reality

A common research approach is to hypothesise a simplified schema and then to examine to what extent this might explain reality, at least under experimental conditions. I am only too aware of the complex and many-sided nature of romanticism. Some of the aspects of this worldview are opposite to some aspects of classicism. But to call these constellations of ideas, ideology and actions 'opposites' is certainly to considerably simplify reality.

In conducting research for this thesis I have been surprised at the relative lack of research in the area of the unconscious motivations for human behaviour. It would be useful to conduct research on these worldviews on a broader scale to examine their influence on human behaviour: how are worldviews formed, how persistent are they, and what causes changes in the way we perceive reality.

Speculative

This research is exploratory and speculative in nature. The idea that romanticism is a worldview that is widespread today, is relatively consistent over time and is measurable is very much a view restricted to a small number of researchers and some luminaries in the history of ideas. There have only been a very limited number of uses of the Romanticism–Classicism Index and the analysis of text for evidence of romanticism.

I think this research presents a convincing case that romanticism is a commonly held worldview that has a major impact. The constellation of ideas expressed by this worldview can be seen and documented in a number of current anti-science movements. And to say things like, 'these people don't have trust in authority', or 'need to be educated' fails to come to grips at any level with why significant numbers of people express themselves in very similar ways about these important issues.

GM debate minus romanticism

The obvious question posed by this thesis is: what would debate over genetically-modified food look like in the absence of a romantic worldview. It that situation it would still not be as simple as taking the science and the impacts on the bottom line in farm production to give all GM products an unequivocal green light. To paraphrase an old saying: if you're a GM scientist or an agribusiness multinational, every food problem must require a GM solution. Golden Rice is a GM variety with a high vitamin A content. Vitamin A deficiency is a serious problem in many underdeveloped countries. While this rice may be part of the answer, it may be that the agricultural and trade situation in these countries may require more complex and holistic solutions. It may be than Golden Rice provides a quick stop-gap measure to prevent unnecessary deaths and illness while more holistic solutions are worked on.

Fear, emotion, belief in conspiracy theories and a lack of confidence in science, do not assist good outcomes when discussing important worldwide problems.

Improvements in the productivity and sustainability of crops around the world should not be delayed or abandoned because of unfounded fears about this technology. Debates over the direction of scientific research and the application of research outcomes are useful and necessary. But such debates are impossible with participants who are absolutely convinced of their opposition to a technology and think that all supporters of it are part of an 'evil' conspiracy.

In terms of how to shift the entrenched positions of those in the anti-GM movement I think the short answer is – you don't. There has been research undertaken where participants' views on a subject are gauged by a survey or interview. They are then presented with information, often in the form of a presentation or short video, and their views are measured again. This could be a useful and interesting line of research on the GM issue.

Glossary

Bt

Bacillus thuringiensis (Bt) is a bacterium which expresses insecticidal proteins, including the Cry1Ab toxin. The genes to produce this insecticidal compound were first commercialised in "Bt Corn" in 1996. (NASA, 2004)

*As insecticide on organic farms: "*Bt proteins has been used in many organic farms for over 50 years as a microbial pest control agent (MCPA). Bt proteins are allowed in organic farming as a insecticide because Bt is a natural, non-pathogenic bacterium that is found naturally in the soil. Bt has also been found to be safe to all higher animals tested." (Chien, 2015)
[For more information on organic farming in Australia and the use of Bt as an organic insecticide go to: http://www.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/pages/organic_food]
Bt cotton was made by inserting a gene from the *baccilus thuringiensis* soil bacterium into cotton hybrids. This gene enables the plant to produce the cry1Ac protein which is lethal to Lepidopterans. This means the plant has an 'in built' weapon against the 'American bollworm'*, Helicoverpa armigera*, which is one of the most serious risk factors for Indian cotton farmers, especially since the cotton plant has a tendency (unusual among plants) to shed bolls when just a fraction of a plant is damaged by pest (Deskmukh, 2010, pp. 179–80).

Byronic hero

The Byronic hero of romantic literature comes in three types "the Noble Outlaw …, the Faust-figure, … and Satan-Prometheus" (Thorsley, 1962, p. 21) – a melancholy male character, often young and rebellious and usually with troubled past that often leads to a tragic end.

Classicism

"The following of ancient Greek or Roman principles and style in art and literature, generally associated with harmony, restraint, and adherence to recognized standards of form and craftsmanship, especially from the Renaissance to the 18th century. Often contrasted with romanticism.The following of traditional and long-established theories or styles." (Pearsall, 2013)

"Adherence to traditional standards (as of simplicity, restraint, and proportion) that are universally and enduringly valid" (Gove, 1981)

Classicism has two dominant meanings in the West. The first concerns the Greeks of the sixth and fifth centuries B.C.E. and their influence, first on the Romans and then on Western cultures from the Renaissance on. The second meaning, evolved from the first, concerns the quality of a work—its style, its structure, and to some extent its content, always with the quality of the Greek models in mind. The Oxford English Dictionary definition, "The principles of classic literature or art; adherence to … a classical style," comprehends both meanings. The word classicism has become a common term since its first use in the nineteenth century. Classicism spread across Europe from Italy to Germany, to France, to Russia, to England, with the place and the time of its usage shading its meaning. It remains a useful term, with contextual clues indicating its intended meaning. (*Science Encyclopedia*, http://science.jrank.org/pages/7568/Classicism.html)

Defined by Aulos Gallius, second century AD grammarian as "A correctness of language and style for a unique, elite, civilised class of people" (Beall, 1999)

Disenchantment

" 'Disenchantment' is a term borrowed from FriedrichSchiller. Weber used it to convey the general impact of rationalization on the individual and society. 'Disenchantment' indicated that the world was undergoing 'demythification' as rational science replaced magic as the means of understanding the empirical world." (Koch, 2009, p. 138)

Folk devil

Coined by British sociologist Stanley Cohen in his ground-breaking book on moral panic (Cohen, 1972), folk devils are social types that serve as a "visible reminders of what we should not be" (Cohen, 1972, p. 10). They are the 'evil party' responsible for an action, or the personification of evil.

Examples of folk devils that Cohen provides include members from several youth sub-cultures such as Teddy Boys, Mods, Rockers, the Hells Angels, Skinheads and Hippies.

Impact science

"…science that identifies environmental and public health impacts of economic production" (McCright *et al*., 2013, p. 1)

Mal du siècle

Literaly means "the malady of the century". In one of the first romantic novels, Chateaubriand defines this idea of ennui, disillusionment or melancholy as: "*He has as it were begotten this ennui, incurable, melancholic, having no cause… [It] has been the sickness of our entire age." (Chateaubriand, 1802, p. 57)*

Moral panic

An instance of public anxiety or alarm in response to a problem regarded as threatening the moral standards of society. (For more information see Cohen, 1972.)

Positivism

"A philosophical system recognizing only that which can be scientifically verified or which is capable of logical or mathematical proof, and therefore rejecting metaphysics and theism. (Pearsall, 2013)

"The theory that laws and their operation derive validity from the fact of having been enacted by authority or of deriving logically from existing decisions, rather than from any moral considerations (e.g. that a rule is unjust). (Pearsall, 2013)

Production science

"…science that provides new inventions or innovations for economic production" (McCright *et al*., 2013, p. 1).

Reductionism

Reduction (reductionism) encompasses several, related philosophical themes. At least three core types can be distinguished: ontological, methodological, and epistemic (Sarkar 1992; cf. Nagel 1998). Even though arguments for and against reductionism often include a combination of positions related to all three, these distinctions are significant because no straightforward entailment relations obtain between the different types of reduction (although tacit commitments about these relations are quite prevalent).

(i) *Ontological reduction* is the idea that each particular biological system (e.g., an organism) is constituted by nothing but molecules and their interactions. In metaphysics this idea is often called physicalism (or materialism), which assumes in a biological context that (a) biological properties supervene on physical properties (i.e., no difference in a biological property without a difference in some underlying physical property), and (b) each particular biological process (or token) is metaphysically identical to some particular physico-chemical process. This latter tenet is sometimes called token-token reduction, in contrast to the stronger tenet that each type of biological process is identical to a type of physico-chemical process. Ontological reduction in this weaker sense is a default stance nowadays among philosophers and biologists though the philosophical details remain controversial, such as whether there are genuinely emergent properties. Various conceptions of physicalism may yield different implications for ontological reduction in biology (Dowell 2006). The denial of physicalism by vitalism, the doctrine that biological systems are governed by forces that are not physico-chemical, is largely of historical interest. (Vitalism also admits of various conceptions, especially with respect to how non-physico-chemical forces are understood; see Section 2.) Some authors have argued vigorously for the significance of metaphysical concepts in the discussion of reductionism in biology (Rosenberg 1978, 1985, 1994, 2006).

(ii) *Methodological reduction* is the idea that biological systems are most fruitfully investigated at the lowest possible level, and that experimental studies should be aimed at uncovering molecular and biochemical causes. A common example of this type of strategy is the decomposition of a complex system into parts (Bechtel and Richardson 1993); a biologist might investigate the cellular parts of an organism in order to comprehend its behavior, or investigate the biochemical components of a cell to understand its features. While methodological reductionism is often

motivated by the presumption of ontological reduction, this procedural recommendation does not follow directly from it. In fact, unlike the idea of ontological reduction, methodological reductionism can be quite controversial. It has been argued that exclusively reductionistic research strategies can be systematically biased so as to overlook salient biological features, and that for certain questions a more fruitful methodology consists in integrating the discovery of molecular causes with the investigation of higher level features (Wimsatt 1980).

(iii) *Epistemic reduction* is the idea that the knowledge about one scientific domain (typically about higher level processes) can be reduced to another body of scientific knowledge (typically concerning a lower and more fundamental level). While an endorsement of some form of epistemic reduction can be motivated by ontological reduction combined with methodological reductionism (e.g., the past success of reductionistic research in biology), the possibility of epistemic reduction does not follow from the conjunction of ontological and methodological reduction. Indeed, debates about reduction in the philosophy of biology have centered on this third type of reduction as the most controversial issue (see Section 4). Our discussion will therefore focus primarily on issues related to epistemic reduction. Prior to evaluating any reduction of one body of knowledge to another, a conception of those bodies of knowledge and what it would mean for them to be "reduced" must be explicated. A number of different models of reduction have been proposed. Thus, the debate about reduction in biology has not only revolved around whether epistemic reduction is possible, but also which notion of epistemic reduction adequately corresponds to actual scientific reasoning. Two basic categories can be distinguished: (a) models of theory reduction maintain that one theory can be logically deduced from another theory (Section 3.1); and, (b) models of explanatory reduction focus on whether higher level features can be explained by representations of lower level features (Brigandt & Love, 2014).

Scientism

"An exaggerated trust in the efficacy of the methods of natural science applied to all areas of investigation (as in philosophy, the social sciences, and the humanities)." (Gove, 1981)

"By scientism I shall understand

a) a view of science as a supra-historic socially neutral enterprise; and

b) the general philosophy which makes the claim that all aspects of the universe are knowable through science and that science as such is the only reasonable, adequate and successful mode of cognition, superior to all other ways. The latter are either degraded as second rate, or as not knowing at all—e.g., metaphysical nonsense, as it was put in the language of logical empiricists, who devoted so much of their energies to finding some criteria of demarcation between science and non-science" (Elzinga, 1984, p. 51).

"Unlike the use of the scientific method as only one mode of reaching knowledge, scientism claims that science alone can render truth about the world and reality. Scientism's single-minded adherence to only the empirical, or testable, makes it a strictly scientifc worldview, in much the same way that a Protestant fundamentalism that rejects science can be seen as a strictly religious worldview. Scientism sees it necessary to do away with most, if not all, metaphysical, philosophical, and religious claims, as the truths they proclaim cannot be apprehended by the scientific method. In essence, scientism sees science as the absolute and only justifiable access to the truth." http://www.pbs.org/faithandreason/gengloss/sciism-body.html

Bibliography

AAAS Board of Directors. (2012). *Statement by the AAAS Board of Directors On Labeling of Genetically Modified Foods*. Washington, DC. Retrieved from www.aaas.org/news/releases/2012/media/AAAS_GM_statement.pdf

Acosta, O., & Chaparro, A. (2008). Genetically modified food crops and public health. *Acta Biologica Colombiana*, *13*(3), 3–26.

Agheyisi, R., & Fishman, J. A. (1970). Trustees of Indiana University Anthropological Linguistics. *Anthropological Linguistics*, *12*(5), 137–157. Retrieved from http://www.jstor.org/page/info/about/policies/terms.jsp

Ahern, S. (2005). Diagnosing Romanticism. *ESC: English Studies in Canada*, *31*(2), 69–76. http://doi.org/10.1353/esc.2007.0008

AIHW. (2012). *Australia's Food and Nutrition*. Canberra: Australian Government. Retrieved from http://www.aihw.gov.au/publication-detail/?id=10737422319&tab=3

AMA statement. (2012, March). http://doi.org/10.1016/S0001-2092(07)60415-3

Athanasiou, T. O. M. (1995). Science wars: ... a book, a conference and a bit of polemic. *Radical Society*, *25*(1), 17–23.

Baker, J. J. (2007). Natural Science and the Romanticisms. *ESQ: A Journal of the American Renaissance*, *53*(4), 387–412. http://doi.org/10.1353/esq.0.0010

Barrows, G., Sexton, S., & Zilberman, D. (2014). Agricultural Biotechnology: The Promise and Prospects of Genetically Modified Crops. *Journal of Economic Perspectives*, *28*(1), 99–120. http://doi.org/10.1257/jep.28.1.99

Bartlett, A. (2007). Frankenstein and Scientific Revelation. *Anthropoetics*, *13*(1), 1–61. Retrieved from www.anthropoetics.ucla.edu/ap1301/1301frank2.pdf

BBC. (2002). Famine-hit Zambia rejects GM food aid. UK. Retrieved from http://news.bbc.co.uk/2/hi/africa/2371675.stm

Beall, S. M. (1999). Aulus Gellius: Composition and the Gentleman Scholar. *Classical Philology*, *94*(1), 55–64.

Beck, U. (1999). *World Risk Society* (5th ed.). Cambridge: Blackwell.

Berlin, I. (1988). *Concepts and categories: Philosophical essays*. (H. Hardy, Ed.) (1st ed.). London: Random House.

Berlin, I. (1999a). In Search of a Definition. In H. Hardy (Ed.), *The Roots of Romanticism* (1st ed., pp. 1–25). Princeton, New Jersey: Princeton University Press.

Berlin, I. (1999b). *The Roots of Romanticism*. (H. Hardy, Ed.) (1st ed.). Princeton, New Jersey: Princeton University Press.

Bernstein, S. (2001). *The compromise of liberal environmentalism* (1st ed.). New York: Columbia University Press.

Biesta, G. (2007). Towards the knowledge democracy? Knowledge production and the civic role of the university. *Studies in Philosophy and Education*, *26*, 467–479. http://doi.org/10.1007/s11217-007-9056-0

Blake, W. (1804). Jerusalem. Retrieved June 12, 2014, from http://www.progressiveliving.org/william_blake_poetry_jerusalem.htm

Bob, C. (2005). *The marketing of Rebellion: Insurgents, Media and International Activism* (1st ed.). London: Cambridge University Press.

Bolsen, T., & Druckman, J. N. (2015). Counteracting the Politicization of Science. In *Climate Change and Extractive Industries: Bridging Research Traditions in an Age of Networked Public Participation*. Boulder, Colorado USA: International Environmental Communication Association. http://doi.org/10.1111/jcom.12171

Borlaug, N. E. (2000). Ending world hunger. The promise of biotechnology and the threat of antiscience

zealotry. *Plant Physiology*, *124*(2), 487–490. http://doi.org/10.1104/pp.124.2.487

Bownas, R. A. (2012). *Transnational Romantics : The Case of Opposition to Genetically Modified Crops in India and its Implications for Transnational Activism*. Cornell.

Brand, S. (2009). *Whole Earth Discipline: An Ecopragmatist Manifesto* (1st ed.). New York: Viking Penguin.

Brass, T. (2000). *Peasants, populism and postmodernism: The return of the agrarian myth* (1st ed.). London: Frank Cass Publishers.

Brigandt, I., & Love, A. (2014). Reductionism in biology. In E. N. Zalta, U. Nodelman, & C. Allen (Eds.), *The Stanford Encyclopedia of Philosophy* (1st ed.). Stanford University Press. Retrieved from http://plato.stanford.edu/archives/win2014/entries/reduction-biology/

Brooks, E. (2004). Transnational Campaigns against Child Labor: The Garment Industry in Bangladesh. In J. Bandy & J. Smith (Eds.), *Coalitions across Borders: Transnational Protest and the Neoliberal Order* (1st ed., p. 246). Oxford: Rowman & Littlefield.

Brossard, D., & Nisbet, M. C. (2006). Deference to scientific authority among a low information public: understanding US opinion on agricultural biotechnology. *Journal of Public Opinion Research*, *19*(1), 24–52.

Brown, J. R. (2001). Scenes from the science wars. *Who Rules in Science? An Opinionated Guide to the Wars*, *42*(03), 1–29. http://doi.org/10.1017/S001221730000487X

Brulle, R. J., Carmichael, J., & Jenkins, J. C. (2012). Shifting public opinion on climate change: An empirical assessment of factors influencing concern over climate change in the US, 2002-2010. *Climatic Change*, *114*(2), 169–188. http://doi.org/10.1007/s10584-012-0403-y

Brunkhorst, H. (1986). Romanticism and Cultural Criticism. *Praxis International*, *6*(4), 397–415.

Buchanan, D. A., & Bryman, A. (2009). *Organisation Research Methods* (1st ed.). London: SAGE Publications.

Burnett, T. (2015). What is scientism. Retrieved July 1, 2015, from http://www.aaas.org/page/what-scientism

Bute, M. (2004). Book review: Romanticism against the Tide of Modernity. *Contemporary Sociology*, *33*(2), 254–256.

Cameron, I., & Edge, D. (1982). Aspects of Scientism. In *Science in a Social Context* (1st ed.). London: Nuffield Foundation.

Carvalho, J. J. . (2006). Overview of the structure of a scientific worldview. *Zygon*, *41*(1), 113–124.

Cassell, J. A., Leach, M., Poltorak, M. S., Mercer, C. H., & Iversen, A. (2006). Is the cultural context of mmr rejection a key to an effective public health discourse? *Public Health*, *120*, 783–794.

Cerier, S. E. (2015). Mandatory GMO food label not backed by science. Retrieved May 22, 2015, from http://www.geneticliteracyproject.org/2015/05/10/mandatory-gmo-food-label-not-backed-by-science/

Charles, D. (2011). Scientist in the Middle of the GM-Organic Wars. *Science*, *332*(April), 168. http://doi.org/10.1126

Chateaubriand, F. de. (1802). *Rene*. (A. S. Kline, Ed.) (1st ed.). Retrieved from http://www.poetryintranslation.com/PITBR/Chateaubriand/ChateaubriandRene.htm

Chien, K. (2015). Bt as organic insecticide. Retrieved February 7, 2015, from http://www.bt.ucsd.edu/organic_farming.html

Chowdhury, M. K. A. (2009). *Biosafety of Genetically Modified Organisms: Basic concepts, methods and issues*. Rome. Retrieved from http://www.fao.org/docrep/012/i1252e/i1252e00.htm

Clements, B. (2012). The sociological and attitudinal bases of environmentally-related beliefs and behaviour in Britain. *Environmental Politics*, *21*(6), 901–921. http://doi.org/10.1080/09644016.2012.724215

Cochrane, R. (2007). Rural poverty and impoverished theory: Cultural populism, ecofeminism, and global justice. *Journal of Peasant Studies*, *34*(2), 167–206. http://doi.org/10.1080/03066150701516674

Cohen, S. (1972). *Folk devils and moral panics: The creation of the mods and the rockers* (3rd ed.). London: Routledge.

Coleman, C.-L., & Ritchie, L. D. (2011). Examining Metaphors in Biopolitical Discourse. *Lodz Papers in Pragmatics*, *7*(1), 29–59. http://doi.org/10.2478/v10016-011-0003-8

Compass, G. (2013). Genetically modified plants: Global cultivation on 174 million hectares. Retrieved May 24, 2015, from http://www.gmo-compass.org/eng/agri_biotechnology/gmo_planting/257.global_gm_planting_2009.html

Cook, G., Pieri, E., & Robbins, P. T. (2004). "The Scientists Think and the Public Feels": Expert Perceptions of the Discourse of GM Food. *Discourse & Society*, *15*(4), 433–449. http://doi.org/10.1177/0957926504043708

Cormick, C. (2013). How values affect our attitudes to genetically modified food. Retrieved November 12, 2014, from http://theconversation.com/how-values-affect-our-attitudes-to-genetically-modified-food-18763

Cotgrove, S. (1978). Styles of Thought: Science, Romanticism and Modernization. *The British Journal of Sociology*, *29*, 358. http://doi.org/10.2307/590106

Coyle, F., & Fairweather, J. (2005). Space, time, and nature: Exploring the public reception of biotechnology in New Zealand. *Public Understanding of Science*, *14*, 143–161.

Cressey, D. (2013). A new breed. *Nature*, *497*(2 May), 27–29.

Crick, F. (1968). *Of Molecules and Men* (1st ed.). Washington, DC: University of Washington Press.

Cronon, W. J. (1995). The Trouble with Wilderness, or, Getting Back to the Wrong Nature. In W. J. Cronon (Ed.), *Uncommon Ground: Rethinking the Human Place in Nature* (1st ed., pp. 69–90). New York: W. W. Norton & Co. Retrieved from http://www.williamcronon.net/writing/Cronon_Trouble_with_Wilderness_1995.pdf

Della Porta, D., & Diani, M. (1999). *Social Movements: An Introduction* (2nd ed.). Oxford: Blackwell.

DeMars, W. E. (2005). *NGOs and Transnational Networks: Wild Cards in World Politics* (1st ed.). London: Pluto Press.

Denney, D. (2005). *Risk & Society* (1st ed.). London: SAGE Publications.

Dent, E. B. (2013). The design, development and evaluation of measures to survey worldview in organisations. Retrieved February 3, 2014, from http://ssrn.com/abstract=2326908

Deskmukh, N. (2010). Agrarian Crisis and Farmer Suicides. In R. S. Deshpande & S. Arora (Eds.), *Agrarian Crisis and Farmer Suicides* (1st ed., pp. 175–192). London: SAGE Publications.

Dewey, J. (1988). Experience, knowledge, and value: A rejoinder. In J. A. Boydston (Ed.), *John Dewey: The later works (1925–1953)* (1st ed., p. 595). Southern Illinois University.

Dickens, C. (1854). *Hard Times* (online). London: Penguin.

DIISR. (2010). *Public attitudes towards biotechnology in Australia: Results of a survey of public attitudes 2009-10*. Canberra. Retrieved from http://www.innovation.gov.au/Industry/Nanotechnology/PublicAwarenessandEngagement/Documents/AustBioAttitude2010.pdf

Dorozenski, M. (2015). The case for organic agriculture. Retrieved July 13, 2015, from http://www.greenpeace.org/usa/en/campaigns/genetic-engineering/our-vision/organic/

Dunlap, R. E. (2000). Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues*, *56*(3), 425–442. http://doi.org/10.1097/00005053-194608000-00032

Eenennaam, A. Van, & Young, A. (2014). Prevalence and impacts of genetically engineered feedstuffs on livestock populations. *Journal of Animal …*, *92*, 4255–4278. http://doi.org/10.2527/jas2014-8124

Egoz, S., Bowring, J., & Perkins, H. C. (2006). Making a "Mess" in the Countryside: Organic Farming and the Threats to Sense of Place. *Landscape Journal*, *25*(1), 54–66. http://doi.org/10.3368/lj.25.1.54

Elzinga, A. (1984). The growth of science: romantic and technocratic images. In A. Elzinga (Ed.), *Essays on Scientism, Romanticism and Social Realist Images of Science* (1st ed., pp. 51–90). Goteborg: Goteborg University.

Engdahl, F. W. (2004). Bio-Imperialism: Why the Biotech Bullies Must Be Stopped. Retrieved May 24, 2015, from https://www.organicconsumers.org/old_articles/monsanto/muststop090304.php

Engels, F. (1845). *Condition of the Working Class in England* (1969th ed.). Moscow: Institute of Marxism-Leninism.

European Commission. (2010). *A decade of EU-funded GMO research (2001–2010)*. *Food, Agriculture, Fisheries and Agriculture Research Report*. Brussels. Retrieved from http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:A+decade+of+EU-funded+GMO+research+(2001+-+2010)#0

Evans, J. R., & Mathur, A. (2005). The value of online surveys. *Internet Research*, *15*(2), 195–219. http://doi.org/10.1108/10662240510590360

Evenson, R. E., & Gollin, D. (2003). Assessing the impact of the green revolution, 1960 to 2000. *Science*, *300*(5620), 758–762. http://doi.org/10.1126/science.1078710

Faflak, J., & Sha, R. C. (2014). *Romanticism and the Emotions* (1st ed.). Cambridge: Cambridge University Press.

Faflak, J., & Wright, J. M. (2012). *A Handbook of Romanticism Studies*. *A Handbook of Romanticism Studies* (1st ed.). Chichester, England: Wiley-Blackwell. http://doi.org/10.1002/9781444356038

FAO. (2006). *Rapid growth of selected Asian economies: Lessons and Implications for Agriculture and Food Security*. *Policy Assistance Series* (Vol. 3). Bangkok.

FAO. (2015). FAO statement on monarch butterflies and Bt maize. Retrieved February 12, 2015, from http://www.fao.org/docrep/003/x9602e/x9602e07.htm

Favret, M. A., & Watson, N. J. (1994). *The limits of romanticism* (1st ed.). Terre Haute, Indiana USA: Indiana University Press.

Fecht, S. (2013). Monsanto vs Monarch butterflies. Retrieved April 24, 2014, from http://www.geneticliteracyproject.org/2013/03/25/monsanto-v-monarch-butterflies/

Fleming, J. (2012). No risk with GMO food, says EU chief scientific advisor. Retrieved September 2, 2013, from http://www.euractiv.com/innovation-enterprise/commission-science-supremo-endor-news-514072

Flinn, C. (1990). The Most Romantic Art of All: Music in the Classical Hollywood Cinema. *Cinema Journal*, *29*(4), 35–50. Retrieved from http://www.jstor.org/stable/1225315 .

Foucault, M. (1997). What is Enlightenment. In P. Rabinow (Ed.), *Ethics: Subjectivity and Truth, Essential Works of Foucault, 1954-1984* (1st ed., pp. 32–50). New York: Pantheon Books.

Freedman, D. H. (2013). The truth about Genetically Modified Food. *Scientific American*, *309*(3), 107–112. Retrieved from http://www.scientificamerican.com/article/the-truth-about-genetically-modified-food/

Freidberg, S. (2003). Not all sweetness and light: New cultural geographies of food. *Social & Cultural Geography*, *4*(1), 3–6. http://doi.org/10.1080/1464936032000049270

Frewer, L. J., Howard, C., Hedderley, D., & Shepherd, R. (1996). What determines trust in information about food-related risks? Underlying psychological constructs. *Risk Analysis*, *16*(4), 473–86. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/8819340

Fromm, H. (2006). Science Wars and Beyond. *Philosophy and Literature*, *30*(2), 580–589. http://doi.org/10.1353/phl.2006.0029

Fuller, S. (2013). “Postmodern postivism”: STS by another name? In S. Fuller (Ed.), *The Philosophy of Science and Technology Studies* (1st ed., p. 208). New York: Routledge.

Giddens, A. (2009). *The politics of climate change* (1st ed.). Cambridge: Polity.

Gigante, D. (2010). Facing the Ugly: The case of “Frankenstein.” *ELH*, *67*(2), 565–587.

Goldman, L. (1976). *Cultural Creation in Modern Society* (1st ed.). Paris: Teleos Press.

Goodman, M. K., Goodman, D., & Redclift, M. (2009). *Situating consumption, space and place* (Environment, Politics and Development Working Paper Series No. 20). *Environment, Politics and Development Working Paper Series*. London. Retrieved from

http://www.kcl.ac.uk/sspp/departments/geography/research/epd/GoodmanetalWP20.pdf

Gouldner, A. W. (1973). Romanticism and Classicism: Deep Structures in Social Science. In A. A. Gouldner (Ed.), *For Sociology: Renewal and Critique in Sociology Today* (1st ed., Vol. 21, pp. 88–107). New York: Basic Books. http://doi.org/10.1177/039219217302108205

Gove, P. B. (Ed.). (1981). *Wesbsters International Dictionary (online)* (3rd ed.). Merriam-Webster. Retrieved from http://www.merriam-webster.com

Graves, R. (1960). *The Greek Myths* (2nd ed.). London: Moyer Bell Ltd.

Greenpeace. (2015). Genetic engineering could be a threat to human and environmental health. Retrieved May 22, 2015, from http://www.greenpeace.org/international/en/campaigns/agriculture/problem/genetic-engineering/

Gross, P. R., & Levitt, N. (1994). *Higher Superstition: The Academic Left and Its Quarrels with Science* (1st ed.). Baltimore: John Hopkins University Press.

Gruère, G. P. (2007). A Review of International Labeling Policies of Genetically Modified Food to Evaluate India ' s Proposed Rule. *AgBioforum*, *10*(1), 51–64. Retrieved from http://www.agbioforum.org/v10n1/v10n1a06-gruere.htm

Gupta, D. (2004). How Rural is Rural India? Rethinking Options for Farming and Farmers. In S. Ray (Ed.), *Handbook of Agriculture in India* (1st ed., pp. 207–231). New Delhi: Oxford University Press.

Hajer, M., & Versteeg, W. (2005). A decade of discourse analysis of environmental politics: Achievements, challenges, perspectives. *Journal of Environmental Policy & Planning*, *7*(3), 175–184. http://doi.org/10.1080/15239080500339646

Hamilton, C. (2010). Why we resist the truth about climate change. *Paper Presented for Climate Controversies: Science and Politics Conference*, *27*(October), 1–15. Retrieved from http://cambioclimatico-bolivia.org/archivos/20120226005942_0.pdf

Hammond, K. (2004). Monsters of modernity: Frankenstein and modern environmentalism. *Cultural Geographies*, *11*(2), 181–198. http://doi.org/10.1191/14744744004eu301oa

Harlow, S., & Harp, D. (2012). Collective Action on the Web. *Information, Communication & Society*, *15*(2), 196–216. http://doi.org/10.1080/1369118X.2011.591411

Hedlund-de Witt, A. (2012). Exploring worldviews and their relationships to sustainable lifestyles: Towards a new conceptual and methodological approach. *Ecological Economics*, *34*, 74–83.

Hellensten, I. (2003). Focus on Metaphors: The case of Frankenfood' on the web. *Journal of Computer-Mediated Communication*, *8*(4).

Heller, C. (2007). French Debate over GM Crops. *American Anthropologist*, *109*(4), 603–615. http://doi.org/10.1525/AA.2007.109.4.603.604

Hennessey, R. (2012). GMO food debate in the national spotlight. Retrieved October 21, 2014, from http://www.forbes.com/sites/rachelhennessey/2012/11/03/gmo-food-debate-in-the-national-spotlight/

Higgins, T. J. (2007). *Australian Academy of Science policy statement on gene technology and GM plants*. Retrieved from http://www.science.org.au/policy/gene-tech.html

Higley, D. L. G. (2012). What is tagging and how does it work? Retrieved March 30, 2015, from http://agbiosafety.unl.edu/basic_genetics.shtml

Hobsbawm, E. (1962). *The Age of Revolution* (1st ed.). New York: Vintage Books.

Hobson-West, P. (2007). "'Trusting blindly can be the biggest risk of all'": Organised resistance to childhood vaccination in the UK. *Sociology of Health & Illness*, *29*(2), 198–215.

Hochstrasser, T. J. (2006). *Natural Law Theories in the Early Enlightenment* (1st ed.). Cambridge: Cambridge University Press.

Hochuli, A. (2008). Is contemporary anti-consumerism a form of romantic anti-capitalism? In *Institute of Ideas Postgraduate Forum* (pp. 1–19). London.

Hogsette, D. S. (2011). Metaphysical Intersections in Frankenstein: Mary Shelley's Theistic Investigation

of Scientific Materialism and Transgressive Autonomy. *Christianity and Literature*, *60*(4), 531–560.

Holbrook, M. B. (1985). *Aims, concepts, and methods* (Graduate School of Business Working Paper Series). New York.

Holbrook, M. B. (1986). Aims, Concepts and Methods for the Representation of individual Differences in Esthetic Responses to Design Features. *Journal of Consumer Research*, *13*(3), 337–347. Retrieved from http://www.jstor.org/stable/2489425

Holbrook, M. B. (1997). Romanticism, Introspection, and the Roots of Experiential Consumption. *Consumption, Markets and Culture*, *1*(2), 97–196.

Holbrook, M. B., & Corfman, K. P. (1984). Quality and Value in the Consumption Experience: Phaedrus Rides Again. In J. Jacoby & J. C. Olson (Eds.), *Perceived Quality: How Consumers View Stores and Merchandise* (1st ed., p. 276). Lexington: D.C. Heath and Co.

Holbrook, M. B., & Onley, J. T. (1995). Romanticism and wanderlust. *Psychology and Marketing*, *12*(3), 207–233.

Hunt, S. E. (2013). The Echoing Greens: The Neo-Romanticism of Earth First! and Reclaim The Streets in the U.K. *Capitalism Nature Socialism*, *24*(2), 83–101. http://doi.org/10.1080/10455752.2013.784526

Hutchings, K. (2007). Ecocriticism in British Romantic Studies. *Literature Compass*, *4*(1), 172–202. http://doi.org/10.1111/j.1741-4113.2006.00417.x

Jacques, P. J., Dunlap, R. E., & Freeman, M. (2008). The organisation of denial: Conservative think tanks and environmental scepticism. *Environmental Politics*, *17*(3), 349–385. http://doi.org/10.1080/09644010802055576

Jasper, J. M. (2010). Social Movement Theory Today: Toward a Theory of Action? *Sociology Compass*, *4*(11), 965–976. http://doi.org/10.1111/j.1751-9020.2010.00329.x

Kahan, D. (2010). Fixing the communications failure. *Nature*, *463*(7279), 296–297. http://doi.org/10.1038/463296a

Kaste, M. (2013). Pollan says GM safe. Retrieved December 12, 2013, from http://www.npr.org/blogs/thesalt/2013/10/16/235525984/so-what-happens-if-the-movement-to-label-gmos-succeeds

Kata, A. (2012). Anti-vaccine activists, Web 2.0, and the postmodern paradigm: An overview of tactics and tropes used online by the anti-vaccination movement. *Vaccine*, *30*(25), 3778–3789. http://doi.org/10.1016/j.vaccine.2011.11.112

Kelley, K. M., & Kime, L. F. (2013). Community Supported Agriculture. Retrieved November 12, 2013, from http://extension.psu.edu/business/ag-alternatives/marketing/community-supported-agriculture-csa

Key, S., Ma, J. K.-C., & Drake, P. M. (2008). Genetically modified plants and human health. *Journal of the Royal Society of Medicine*, *101*(6), 290–8. http://doi.org/10.1258/jrsm.2008.070372

Khush, G. S. (2001). Green revolution: the way forward. *Nature Reviews Genetics*, *2*(10), 815–822. http://doi.org/10.1038/35093585

Kingsbury, N. (2009). *Hybrid: The history and science of plant breeding* (1st ed.). Chicago: University of Chicago Press.

Kirwan, J. (2004). Alternative Strategies in the UK Agro-Food System: Interrogating the Alterity of Farmers' Markets. *Sociologica Ruralis*, *44*(4), 395–415.

Kitcher, P. (2012, May). The Trouble With Scientism: Why history and the humanities are also a form of knowledge. *The New Republic*. Retrieved from http://www.newrepublic.com/article/books-and-arts/magazine/103086/scientism-humanities-knowledge-theory-everything-arts-science

Koch, A. M. (2009). Rationality, Romanticism and the Individual: Max Weber's "Modernism" and the Confrontation with "Modernity." *Canadian Journal of Political Science*, *26*(01), 123. http://doi.org/10.1017/S0008423900002481

Kruiff, J. W. F. (2011). *Love at First Shape*. University of Twente (Netherlands).

Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin*, *108*(3), 480–498. http://doi.org/10.1037/0033-2909.108.3.480

Larson, H. J., Cooper, L. Z., Eskola, J., Katz, S. L., & Ratzan, S. (2011). Addressing the vaccine confidence gap. *The Lancet*, *378*(9790), 526–535. http://doi.org/10.1016/S0140-6736(11)60678-8

Latour, B. (1983). Give me a laboratory and I will raise the world. In K. D. Knorr & M. Mulkay (Eds.), *Science observed* (1st ed., pp. 141–170). London: SAGE Publications.

Latour, B. (1987a). *Science in Action* (1st ed.). Milton Keynes: Open University Press.

Latour, B. (1987b). *Science in action: How to follow scientists and engineers through society* (1st ed.). Cambridge, Mass.: Harvard University Press.

Latour, B. (1993). *We Have Never Been Modern* (1st ed.). Cambridge, Mass.: Harvard University Press.

Latour, B. (2004). *Politics of Nature: How to Bring the Sciences into Democracy*.

Latour, B. (2011a). Love your monsters. In M. S. and T. Nordhaus (Ed.), *Love your monsters: Postenvironmentalism and the Anthropocene* (Kindle). Oakland, California: The Breakthrough Institute.

Latour, B. (2011b). Politics of nature: East and West perspectives. *Ethics & Global Politics*, *4*(1), 71–80. http://doi.org/10.3402/egp.v4i1.6373

Lau, J. (2015). Same Science, Different Policies: Regulating Genetically Modified Foods in the U.S. and Europe. Retrieved August 10, 2015, from http://sitn.hms.harvard.edu/flash/2015/same-science-different-policies/

Levidow, L. (1999). Britain's Biotechnology Controversy: Elusive Science, Contested Expertise. *New Genetics and Society*, *18*, 47–64.

Levidow, L. (2000). Pollution Metaphors In The Uk Biotechnology Controversy. *Science as Culture*, *9*(3), 325–351. http://doi.org/10.1080/713695257

Lewandowsky, S. (2013). Right, left, wrong; people reject science because... Retrieved November 21, 2013, from https://theconversation.com/right-left-wrong-people-reject-science-because-18789

Lewandowsky, S. (2015). Recurrent Fury: Conspiratorial Discourse in the Blogosphere Triggered by Research on the Role of Conspiracist Ideation in Climate Denial. *Journal of Social and Political Psychology*, *3*(1), 142–178. http://doi.org/10.5964/jspp.v3i1.443

Lewandowsky, S., Gignac, G. E., & Oberauer, K. (2013). The Role of Conspiracist Ideation and Worldviews in Predicting Rejection of Science. *PLoS ONE*, *8*(10). http://doi.org/10.1371/journal.pone.0075637

Lewis, P. (1992, June 16). Mutant Foods Create Risks We Can't Yet Guess; Since Mary Shelley. *New York Times*. New Jersey. Retrieved from http://www.nytimes.com/1992/06/16/opinion/l-mutant-foods-create-risks-we-can-t-yet-guess-since-mary-shelley-332792.html

Lovejoy, A. (1924). On the discrimination of romanticism. *Publications of the Modern Language Association of America*, *39*(2), 229–253.

Lovejoy, A. (1932). The Parallel of Deism and Classicism. *Modern Psychology*, *29*(3), 281–299. Retrieved from www.jstor.org/stable/433614

Lovejoy, A. (1936). *The Great Chain of Being: A study of the history of an idea* (Kindle). Cambridge, Mass.: Harvard University Press.

Lovejoy, A. (1941). The Meaning of Romanticism for the Historian of Ideas. *Journal of the History of Ideas*, *2*(3), 257–278.

Lowy, M., & Sayre, R. (2001). *Romanticism Against the Tide of Modernity* (1st ed.). London: Duke University Press.

Lynas, M. (2011). *The god species: How humans really can save the planet* (1st ed.). London: Fourth Estate.

Lyons, K., & Scrinis, G. (2010). Nanotechnology and the Techno-Corporate Agri-food paradigm. In G. Lawrence, K. Lyons, & T. Wallington (Eds.), *Food Security, Nutrition and Sustainability: New Challenges, Future Options* (1st ed.). London: Earthscan. Retrieved from http://www.gyorgyscrinis.com/publications/

Mah, H. E. (1986). Karl Marx in love: The enlightenment, romanticism and Hegelian theory in the young Marx. *History of European Ideas*, *7*(5), 489–507.

Maibach, E., Roser-Renouf, C., & Leiserowitz, A. (2009). *Global Warming's "Six Americas" 2009: An audience segmentation*. Washington, DC.

Malka, A., Krosnick, J. A., & Langer, G. (2009). The association of knowledge with concern about global warming: trusted information sources shape public thinking. *Risk Analysis*, *29*(5), 633–647.

Marx, K., & Engels, F. (1847). *The Communist Manifesto*. *Marx/Engels Selected Works, Vol. One* (12th ed.). Moscow: Progress Publishers. Retrieved from www.marxists.org/archive/marx/works/download/pdf/Manifesto.pdf?

Masters, B. S. (2004). *Safety of Genetically Engineered Foods: Approaches to Assessing Unintended Health Effects*. Washington, DC. Retrieved from http://www.nap.edu/catalog/10977.html

McCright, A. M., Dentzman, K., Charters, M., & Dietz, T. (2013). The influence of political ideology on trust in science. *Environmental Research Letters*, *8*(4), 9. http://doi.org/10.1088/1748-9326/8/4/044029

McIntyre, B. D., Herren, H. R., Wakhungu, J., & Watson, R. T. (2008). *Agriculture at a crossroads*. *Science And Technology*. Retrieved from http://www.agassessment.org/reports/IAASTD/EN/Agriculture at a Crossroads_Global Report (English).pdf

McNeil, D. G. (2000, March 14). New genes and seeds: protesters grow more passionate. *New York Times*. New York.

Meadowsong, Z. (2009). Thomas Hardy and the Machine: The Mechanical Deformation of Narrative Realism in Tess of the d'Urbervilles. *Nineteenth-Century Literature*, *64*(2), 225–248. Retrieved from http://www.jstor.org/stable/10.1525/ncl.2009.64.2.225

Meek, D. S. (2013). *Assessing risks from genetically modified organisms*. Canberra. Retrieved from http://www.ogtr.gov.au//internet/ogtr/publishing.nsf/Content/factbulletin-1

Mercer, D. (1999). The Higher Moral Panic: Academic Scientism and its Quarrels with Science and Technology Studies. *Prometheus: Critical Studies in Innovation*, *17*(1), 77–85.

Michael, M. T. (2002). Africa Bites the Bullet on Genetically Modified Food Aid. Retrieved May 21, 2015, from http://www.worldpress.org/Africa/737.cfm

Michie, E. B. (1988). Production replaces creation: Market forces and Frankenstein as critique of romanticism. *Nineteenth-Century Contexts*, *12*(1), 27–33. http://doi.org/10.1080/08905498808583273

Miller, H. I., & Conko, G. (2004). *The Frankenfood Myth: How protest and politics threaten the biotech revolution* (1st ed.). Westport: Praeger.

Monod, J. (1974). *Chance and Necessity* (First). London: Fontana.

Moore, C. A., & Runes, D. D. (1946). *The Dictionary of Philosophy*. *Philosophy East and West* (1st ed., Vol. 1). New York: Philosophical Library. http://doi.org/10.2307/1396860

Morrell, M. (2011). Efficient crops for Australian conditions. *Food Futures Flagship, CSIRO, Newsletter*. Canberra.

Mpofu, T. (2010, June 7). Starving Zimbabwe rejects GM maize. *The National*. Dubai. Retrieved from http://www.thenational.ae/news/world/africa/starving-zimbabwe-rejects-gm-maize

Murdoch, J., & Miele, M. (1999). `Back to Nature´: Changing `Worlds of Production´ in the Food Sector. *Sociologia Ruralis*, *39*(4), 465–483.

Nairn, A., & Berthon, P. (2003). Creating the Customer: The Influence of Advertising on Consumer Market Segments – Evidence and Ethics. *Journal of Business Ethics*, *42*, 83–99.

Nairn, A., & Berthon, P. (2005). Affecting Adolescence: Scrutinizing the Link between Advertising and Segmentation. *Business & Society*, *44*(3), 318–345. http://doi.org/10.1177/0007650305278088

NASA. (2004). *Technical Report on Bt*. Retrieved from http://ntrs.nasa.gov/search.jsp?R=MSFC-9804671

Needleman, J. (1975). *Sense of the Cosmos: The Encounter of Modern Science and Ancient Truth* (1st ed.). New York: Doubleday.

Nelkin, D. (1978). Threats and Promises: Negotiating the Control of Research. *Limits of Scientific Inquiry*, *107*(2), 191–209.

Nemoianu, V. (2005). Sacrality and the Aesthetic in the Early Nineteenth Century. In M. Ferber (Ed.), *A companion to European Romanticism* (1st ed., p. 602). London: Blackwell.

Nitz, H. J. (1992). The temporal and spatial pattern of field reorganisation in Europe (18th and 19th centuries). In A. Verhoeve & J. Verhoeve (Eds.), *he Transformation of the European Rural Landscape: Methodological Issues and Agrarian Change 1770-1914* (First, pp. 146–158). Amsterdam: Tijdschrift van de Belg.Ver.

North, P. (2015). The business of the Anthropocene? Substantivist and diverse economies perspectives on SME engagement in local low carbon transitions. *Progress in Human Geography*, *1*(18). http://doi.org/10.1177/0309132515585049

Northcutt, W. (2003). José Bové vs McDonald's: The Making of a National Hero in the French. *Proceedings of the Western Society for French History*, *31*, 326–345. Retrieved from http://hdl.handle.net/2027/spo.0642292.0031.020

Olorunnisola, A. A., & Martin, B. L. (2013). Influences of media on social movements: Problematizing hyperbolic inferences about impacts. *Telematics and Informatics*, *30*(3), 275–288.

Osgood, C. E. G. (1957). *The Measurement of Meaning* (1st ed.). Urbana, Illinois: University of Illinois Press.

Ossewaarde, M. (2007). The Dialectic between Romanticism and Classicism in Europe. *European Journal of Social Theory*, *10*(4), 523–542. http://doi.org/10.1177/1368431007084369

Otto, S. L. (2011). *Fool me twice: fighting the assault on science in America* (1st ed.). New York: Rodale.

Outram, D. (2005). What is Enlightenment? In *The Enlightenment* (2nd ed., pp. 1–9). Cambridge: Cambridge University Press.

Parsons, T. (1954). *Essays in sociological theory* (2nd ed.). The Free Press.

Pater, W. (1947). Romanticism. In F. W. Roe (Ed.), *Victorian Prose* (1st ed., pp. 583–590). New York: The Roland Press Company.

Paterlini, M. (2013). Swedish scientists decry government links to anti-GMO "vandals." Retrieved from http://blogs.nature.com/news/2013/11/swedish-scientists-decry-government-links-to-anti-gmo-vandals.html

Pearsall, J. (Ed.). (2013). *The Oxford English Dictionary (online)* (1st ed.). Oxford University Press. Retrieved from http://www.oxforddictionaries.com/

Perkins, J. H. (1982). The Rockefeller Foundation and the. *Agriculture and Human Values*, *7*, 6–18.

Peters, E., & Slovic, P. (1996). The Role of Affect and Worldviews as Orienting Dispositions in the Perception and Acceptance of Nuclear Power. *Journal of Applied Social Psychology*, *26*(16), 1427–1453. http://doi.org/10.1111/j.1559-1816.1996.tb00079.x

Pingali, P. (2003). Sustaining food security in the developing world: The top five policy challenges. *Quarterly Journal of International Agriculture*, *42*(3), 261–272. http://doi.org/10.1016/S0306-9192(02)00012-X

Pollan, M. (2008). *In Defense of Food: An Eater's Manifesto* (1st ed.). New York: Penguin Press.

Press, M., & Arnould, E. J. (2011). Legitimating community supported agriculture through American pastoralist ideology. *Journal of Consumer Culture*, *11*(2), 168–194. http://doi.org/10.1177/1469540511402450

Purushottam, K. M. (2006). *Lessons and Implications for Agriculture and Food Security*. *Rapid Growth of Selected Asian Economies* (Vol. 3). Bangkok.

Ravi, S., & Engler, M. (2015). Workfare as an Effective Way to Fight Poverty: The Case of India's NREGS. *World Development*, *67*, 57–71.

Read, R. (2014). The real reason why libertarians become climate-deniers. Retrieved October 12, 2014, from http://blog.talkingphilosophy.com/?p=7957

Reill, P. H., & Wilson, E. J. (2004). *Encyclopedia of The Enlightenment* (2nd ed.). New York: Book Builders.

Rhodes, S. D., Bowie, D. A., & Hergenrather, K. C. (2003). Collecting behavioural data using the world wide web: considerations for researchers. *Journal of Epidemiology Community Health*, *57*, 68–73. http://doi.org/doi:10.1136/jech.57.1.68

Roco, M. C. (2004). Nanoscale Science and Engineering: Unifying and Transforming Tools. *AIChE*, *50*(5), 890–897.

Ropeik, D. (2014, February). How we perceive the risk of GMOs. *Cosmos*. Retrieved from https://cosmosmagazine.com/society/how-we-perceive-risk-gmos

Roseboro, K. (2013). The GMO Seed Monopoly: Fewer Choices, Higher Prices. Retrieved December 11, 2013, from http://www.fooddemocracynow.org/blog/2013/oct/4/the_gmo_seed_monopoly_fewer_choices_higher_prices

Ross, A. (1996). *Science Wars*. New York: Duke University Press.

Roszak, T. (1969). *The Making of a Counter Culture* (1st ed.). New York: Doubleday.

Roszak, T. (1972). *Where the Wasteland Ends: Politics and Transcendence in Post-industrial Society* (1st ed.). New York: Doubleday.

S.A. Editors. (2013). Labels for GMO foods are a bad idea. *Scientific American*, *309*(4), 19. Retrieved from http://www.scientificamerican.com/article.cfm?id=labels-for-gmo-foods-are-a-bad-idea&WT.mc_id=SA_DD_20130906

Sagatova, A. S., & Abeshova, Z. A. (2013). The concept of worldview in Shakarim's creative activity. *Education and Science without Borders*, *4*(8), 111–114.

Sayre, R., & Lowy, M. (1984). Figures of Romantic Anti-Capitalism. *New German Critique*, *32*(Spring-Summer), 42–92. Retrieved from http://www.jstor.org/stable/488156

Sayre, R., & Lowy, M. (2005). Romanticism and Capitalism. In M. Ferber (Ed.), *The companion to European Romanticism* (1st ed., pp. 433–449). London: Blackwell.

Schick, T. (2000). *Readings in the philosophy of science: from positivism to postmodernism* (1st ed.). Mountain View, California: Mayfield Publishing.

Schmitt, C. (1919). *Political romanticism* (1986th ed.). Berlin: Duncker & Humblot.

Schnaiberg, A. (1977). Obstacles to Environmental Research by Scientists and Technologists: A Social Structural Analysis. *Social Problems*, *24*(5), 500–520.

Schurman, R. (2004). Fighting "Frankenfoods": Industry Opportunity Structures and the Efficacy of the Anti-Biotech Movement in Western Europe. *Social Problems*, *51*(2), 243–268. http://doi.org/10.1525/sp.2004.51.2.243

Schurman, R., & Munro, W. (2006). Ideas, thinkers, and social networks: The process of grievance construction in the anti-genetic engineering movement. *Theory and Society*, *35*, 1–38. http://doi.org/10.1007/s11186-006-6779-9

Schurman, R., & Munro, W. A. (2010). *Fighting for the Future of Food: Activists versus agribusiness in the struggle over biotechnology* (1st ed.). Minneapolis: University of Minnesota Press.

Scott, C. (2004). Angola rejects GM food aid. Retrieved May 21, 2015, from http://www.scidev.net/global/gm/news/angola-rejects-gm-food-aid.html

Sebald, H. (2015). New-Age Romanticism: The quest for an alternative lifestyle as a force of social change. *Humboldt Journal of Social Relations*, *11*(2).

Shapin, S. (1998). Placing the view from nowhere : historical and sociological problems in the location of science. *Transactions of the Institute of British Geographers*, *23*(1), 5–12. http://doi.org/10.1111/j.0020-2754.1998.00005.x

Shaw, A. (2002). "It just goes against the grain." Public understandings of genetically modified (GM) food in the UK. *Public Understanding of Science (Bristol, England)*, *11*, 273–291. http://doi.org/10.1088/0963-6625/11/3/305

Shiva, V. (1988). *Staying Alive: Women, Ecology and Survival in India*. *Community practitioner : the journal of the Community Practitioners' & Health Visitors' Association* (1st ed., Vol. 84). New Delji:

Kali for women. Retrieved from http://gyanpedia.in/Portals/0/Toys from Trash/Resources/books/stayingalive.pdf

Shiva, V. (1993a). *Monocultures of the mind: perspectives on biodiversity and biotechnology* (1st ed.). London: Zed Books.

Shiva, V. (1993b). *The violence of the Green Revolution* (2nd ed.). London: Zed Books.

Shiva, V. (2005). *New Wars: Seed, water and life forms* (1st ed.). New Delhi: Women Unlimited.

Silverman, D. (1993). Theory and Method in Qualitiave Research. In *Interpreting Qualitative Data: Methods for Analysing Talk, Text and Interaction* (4th ed., pp. 1–19). London: SAGE Publications.

Singh, R. B. (2015). A second Green Revolution? Retrieved August 10, 2013, from http://www.icarda.org/features/second-green-revolution#sthash.ve8Y7Z04.dpbs

Smith, A. (2015). *Public and scientists' view on science and society*. Washington, DC. Retrieved from http://www.pewinternet.org/files/2015/01/PI_ScienceandSociety_Report_012915.pdf

Smith, D. E. (2013). Romanticism in America: The Transcendentalists. *The Review of Politics*, *35*(3), 302–325.

Smith, J. (2013). 10 Reasons to Avoid GMOs. Retrieved January 12, 2014, from http://www.responsibletechnology.org/10-Reasons-to-Avoid-GMOs

Snow, C. P. (1959). *The two cultures* (15th ed.). Cambridge: Cambridge University Press.

Solli, A., Bach, F., & Åkerman, B. (2014). Learning to argue as a biotechnologist: Disprivileging opposition to genetically modified food. *Cultural Studies of Science Education*, *9*(1), 1–23. http://doi.org/10.1007/s11422-013-9528-1

Specter, M. (2000, April). The pharmaceutical riddle. *The New Yorker*, 58–71.

Specter, M. (2014, August). Seeds of doubt: An activist's controversial crusade against genetically modified crops. *The New Yorker*. Retrieved from http://www.newyorker.com/magazine/2014/08/25/seeds-of-doubt

Staudenmaier, P. (1995). Fascist Ecology: The Green Wing of the Nazi Party and Its Historical Antecedents. In J. Biehl & P. Staudenmaier (Eds.), *Ecofacsism: Lessons from the German Experience* (1st ed., p. 73). Edinburgh: AK Press. Retrieved from http://ruby.fgcu.edu/courses/twimberley/EnviroPol/EcofascismGerman.pdf

Stemler, S. (2001). An Overview of Content Analysis. *Practical Assessment, Research & Evaluation*, *7*(17), 1–9. http://doi.org/10.1362/146934703771910080

Stevens, D. (2004). *Romanticism* (1st ed.). Cambridge: Cambridge University Press.

Sullivan, J. (1976). *Cambridge Experimentation Review Board Guidelines*. Massachusetts.

Summers, B. J. (1986). Dr. Frankenstein and the ACH. *Economic Review*, (April), 4–8.

Swinnen, J. F. M., & Maertens, M. (2007). Globalization, privatization, and vertical coordination in food value chains in developing and transition countries. *Agricultural Economics*, *37*(S1), 89–102. http://doi.org/10.1111/j.1574-0862.2007.00237.x

Tait, J. (2001). More Faust than Frankenstein: The European debate about the precautionary principle and risk regulation for genetically modified crops. *Journal of Risk Research*, *4*(2), 175–189.

Tarrow, S. (1994). *Power in Movement: Social Movements, Collective Action and Politics* (1st ed.). Cambridge: Cambridge University Press.

Thompson, E. P. (1993). *The Making of the English Working Class*. New York: Vintage Books.

Thomson, J. A. (2006). *GM crops: The impact and the potential* (1st ed.). Collingwood: CSIRO Publishing.

Thorsley, P. (1962). *The Byronic Hero Book Subtitle: Types and Prototypes* (1st ed.). Los Angeles: University of Minnesota Press.

Tiryakian, E. A. (1992). Dialectics of Modernity: Reenchantment and Dedifferentiation as Counterprocesses. In H. Haferkamp & N. J. Smelser (Eds.), *Social Change and Modernity* (1st ed., pp. 78–95). Berkeley: University of California Press. Retrieved from http://www.communication-sensible.com/download/Social Change and Modernity.pdf

Tranter, B. (2011). Political divisions over climate change and environmental issues in Australia. *Environmental Politics*, *20*(1), 78–96. http://doi.org/10.1080/09644016.2011.538167

Tribe, D., & Roush, R. (2013). For GM food and vaccinations, the panic virus is a deadly disease. Retrieved February 14, 2014, from https://theconversation.com/for-gm-food-and-vaccinations-the-panic-virus-is-a-deadly-disease-18460

UN. (2010). World Population Prospects, the 2010 revision. Retrieved March 15, 2013, from http://esa.un.org/unpd/wpp/index.htm

Vidal, C. (2008). What is a worldview? In H. Van Belle & J. Van der Veken (Eds.), *Nieuwheid denken. De wetenschappen en het creatieve aspect van de werkelijkheid* (1st ed., pp. 1–13). Leuven: Acco. Retrieved from http://cogprints.org/6094/

Vivas, E. (2010). Food sovereignty: Something's moving in Europe. Retrieved August 12, 2013, from http://cadtm.org/Food-Sovereignty-something-s

Waddell, C. (1989). Reasonableness versus rationality in the construction and justification of science policy decisions: the case of the Cambridge Experimentation Review Board. *Science, Technology & Human Values*, *14*(1), 7–25. http://doi.org/10.1177/016224398901400102

Wallace, H. (2010). *Bioscience for Life? Who decides what research is done in health and agriculture?* Retrieved from http://www.genewatch.org/pub-492774

Wallen, M. (2004). *City of Health, Field of Disease: Revolutions in the Poetry, Medicine, and Philosophy of Romanticism* (1st ed.). Burlington: Ashgate.

Walsh, B. (2013). Modifying the endless debate over GMOs. Retrieved November 23, 2013, from http://science.time.com/2013/05/14/modifying-the-endless-genetically-modified-crop-debate/

Walter, M. (2012). *Social Research Methods* (2ND ed.). Melbourne: Oxford University Press.

Waltz, E. (2009). GM crops: Battlefield. *Nature*, *461*(7260), 27–32. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/19727179

Weber, M. (1946). Science as a Vocation. In H. H. Gerth & C. W. Mills (Eds.), *From Max Weber: Essays in Sociology* (1st ed., pp. 129–156). New York: Oxford University Press.

Weiss, J. (1987). On the Irreversibility of Western Rationalism and Max Weber's Alleged Fatalism. In S. W. and S. Lash (Ed.), *Max Weber, Rationality and Modernity* (1st ed., pp. 154–163). London: Allen and Unwin.

Weissman, J. (1976). A Reading of Frankenstein as the Complaint of a Political Wife. *Colby Quarterly*, *12*(4), 171–180.

Wellek, R. (1961). The concept of realism in literary scholarship. *Neophilologus*, *45*(1), 1–20.

Winickoff, D., Jasanoff, S., Busch, L., Grove-White, R., & Wynne, B. (2005). Adjudicating the GM food wars: science, risk, and democracy in world trade law. *Yale Journal of International Law*, *30*(81), 82–123. Retrieved from http://sro.sussex.ac.uk/37092/

Wolfe, A. (1995). Realism and romanticism in sociology. *Social Science And Public Policy*, *32*(2), 56–63.

Wright, O. (2015, June). Ex-Greenpeace director denounces "immoral" groups that campaign against GM foods. *The Independent*. London. Retrieved from http://www.independent.co.uk/environment/exgreenpeace-director-denounces-immoral-groups-that-campaign-against-gm-foods-10306370.html

Wynne, B. (2014). Further disorientation in the hall of mirrors. *Public Understanding of Science (Bristol, England)*, *23*(1), 60–70. http://doi.org/10.1177/0963662513505397

Appendix 1: The survey used for this research

Thanks for agreeing to participate in this survey. The questions are mostly very short and should not take you long to answer. The survey should take 15-20 minutes. Most of the questions ask for your opinion on a statement from "Strongly Agree" to "Strongly Disagree". To answer, just click on a button in the column that matches your view of the statement.

A

Please choose the appropriate response for each item:

		Strongly Agree	Agree	Somewhat Agree	Neither Agree nor Disagree	Somewhat Disagree	Disagree	Strongly Disagree	Can't choose
1	One should adopt a conservative lifestyle. –								
2	Truth often involves an element of mysticism. +								
3	I am a practical person. –								
4	Sensitivity is a valuable trait. +								
5	In art, colour excites me more than form. +								
6	A routine way of life is preferable to unpredictability. –								
7	I think that life is an awesome mystery. +								
8	Uncertainty is exciting. +								
9	I am a sensitive person. +								
10	Progress in science, technology and education continues to ensure a brighter tomorrow. –								
11	Rigorous training is the true basis of athletic skill. –								
12	Facts are more important than feelings. –								
13	I enjoy art that expresses the artist's emotions. +								
14	A cool head wins every time. –								

B

		Strongly Agree	Agree	Somewhat Agree	Neither Agree nor Disagree	Somewhat Disagree	Disagree	Strongly Disagree	Can't choose
15	Sometimes evil is consistent with greatness. +								
16	Intuition is a valuable tool. +								
17	Disorganisation is a major flaw. –								
18	I believe that first impressions are almost always correct. +								
19	Paintings should attempt to represent their subjects with maximum realism. –								
20	I am not an emotional person. –								
21	It is O.K. to be eccentric. +								
22	I am organised. –								
23	Every decision deserves to be carefully thought out. –								
24	I think of myself as eccentric. +								
25	The heart, not the brain, should be your guide. +								
26	I like to touch sculpture. +								
27	People should try to be more tender. +								
28	Feelings are more important than facts. +								

C

		Strongly Agree	Agree	Somewhat Agree	Neither Agree nor Disagree	Somewhat Disagree	Disagree	Strongly Disagree	Can't choose
29	Idealism is a wonderful quality. +								
30	Logic can solve any problem. –								
31	When I am being taken somewhere in an unfamiliar place, I like to know exactly where I am and where I am going. –								
32	Occasionally it's OK to be moody. +								
33	I am impulsive. +								
34	In life, unpredictability is preferable to routine. +								
35	I like to keep my home neat and orderly. –								
36	One's actions should always be carefully planned. –								
37	I prefer to live in a certain amount of chaos. +								
38	One should remain stable at all times. –								
39	I prefer a routine way of life to an unpredictable one. –								
40	A nice home is always neat and orderly. –								
41	I think of myself as a precise person. –								
42	Absent-mindedness is a lovable characteristic. +								

D

		Strongly Agree	Agree	Somewhat Agree	Neither Agree nor Disagree	Somewhat Disagree	Disagree	Strongly Disagree	Can't choose
43	I think of myself as a natural person. +								
44	One should always be precise. –								
45	It is fun to be exposed to people with new ideas. +								
46	I tend to be a serious person. –								
47	It's O.K to daydream a lot. +								
48	Self-control is all-important. –								
49	I am precise about where I keep my possessions. –								
50	I am easily distracted. +								
51	New ideas are exciting. +								
52	I am a controlled person. –								
53	Forgetfulness is forgivable. +								
54	I have a scientific outlook on most problems. –								
55	One should always be rational. –								

Those questions marked with a + are romanticist questions (scored 7 down to zero, left to right). Those marked with a – are classicist questions (scored 1 to 7 then zero, left to right). Obviously the + and – were not in the actual survey, nor were the question numbers. The A, B, C at the top of each group of questions was a separate web page of the survey.

What do you think are the main factors for some people's reluctance to eat genetically modified food? *

What do you think are the potential environmental impacts of genetically modified crops?

What do you think is the media's attitude to genetically modified food?

Completely in favour	Somewhat in favour	Neutral	Somewhat opposed	Completely opposed	Can't choose
❍	❍	❍	❍	❍	❍

F

Some background biographical information. [Please remember that this survey is anonymous.]

What is your gender? ❍ Male, ❍ Female

What year were you born? (Please use four digits for the year.) ☐☐☐☐

How long have you been a supporter of the anti-GM food movement?

Less than 6 months	6–12 months	1 to 2 years	More than 2 years	Not sure	I'm not a supporter
❍	❍	❍	❍	❍	❍

Thank you for completing this survey.

Appendix 2: Answers to open survey questions

What do you think are the main factors for some people's reluctance to eat genetically modified food?

Fear of harmful consequences.

It's not safe to eat.

Fear of the unknown and not understanding the process involved with modifications made to food they may eat.

The effect on the DNA, death of important insects such as bees and the fact that it is controlled by an unethical multi-national firm MONSANTO.

GMO food are toxic and should be banned. FULL STOP! I want to eat food that is not killing me from the inside out!

Dislike of unnatural and monoculture

We like organic real food not something that may have chemically deprived animal components. i collec tseed and grow food, i want my vegies to come from my own seed bank

Evolution has always been a very slow process, hence the immediate changing genetically of foods cannot be scientifically quantified in the short term to assure people of its safety.

Long-term health risks.

Terrible side effects.

Corporate controlled.

Not sustainable.

Cause of illness & contributes to disorders.

Unknown health impacts

Rational reasons – poor safety in its research and productions.

Common reasons - ick-factor, not natural.

Hormones and other additives in the food affecting our children's health long term.

It isn't natural, organic food is seen as the best for the body.

Uncertainty about impact on health and environment.

There is not enough scientific recorded results in the effects of eating genetically modified foods. Cross breeding genetic strands from one species to another to "enhance" a particular trait without proper testing over a very prolonged period of time will result in un-foreseen consequences. We do not need to change what millions of years of evolution has done to everything on this planet. Everything we need to combat sickness, disease and other related problems can and will eventually be found through organic means. We do not need to "modify" our food source, its already were it needs to be.

Safety of the food. Untrusting that it will mutate genes, DNA leading to the end of a healthy human race.

Uncertainty.

I think those with both an eccentric nature and those from a science background agree.

Undermining genetic diversity and biodiversity and natural selection. Fear of the unknown impacts of modified genes on human health, cancer causing.

Unnatural, too controlled

Uncertainty

That it is somehow cancer causing.

That it disrupts the "natural" order of things.

That it can cross over to other species and have unintended consequences.

Intelligence

Health issues.

Large companies holding too much control over what is grown and availability of seed.

I happen to believe that nature is perfect! We are dabbling in areas without proper assessment! We have seen similar consequences when cane toads were introduced! GM seeds and food do not require the same rigorous checks and tests as some other items (medication). GM is only tested for 90 days or does not require testing because they are considered to be food additives. And why would I want to eat food that is laced with pesticides?

Health concerns; loss of biodiversity

Mucking around with nature.

Don't believe the Corporate speak about its harmlessness.

Unknown long term effects

Concern on the negative health impacts. The unknown impacts as not enough science behind it.

The unknown.

Not educated on issue.

Scaremongering by leftist media.

Potential for 'something' bad to happen.

1. Concerns of effects of long time use. 2. The bias research by companies. 3. The fact they won't label it. 4. The fact they sue states for the right not to label it. 5. The contamination of organic food supplies. 6. The monopoly on the industry.

It's not independently tested for a long period of time.

Who (beside big food corp, want apples that don't brown!?) seriously, if you're not going to eat the fucking thing, don't cut it open.

It's proven to do more harm than good.

Farmers can't harvest and keep their seed.

GM crops spread like a weed.

Less nutrients.

Harmful to ingest products that have been doused over and over by poisonous pesticide and herbicides.

Unknown consequences to the food itself and to human physiology, effects on the environment and living creatures.

Reliance on short studies funded by those with GM interests.

Fear of contaminating non GM foods with GM crops and animals. No way back.

Studies showing transfer to embryo.

There is no evidence through long term studies that this is safe. We also need to ask ourselves why GMOs? Like pharmaceutical companies you can only patent drugs not nature. GMOs are the same with the food supply as you can't patent nature.

Unknown side effects, health issues, environmental long term issues.

As someone, who is hyper sensitive to synthetic & some naturally occurring chemicals, it took many years to work out that processed & some 'fresh' foods were much to do with health issues. Guessing I'm not the only one.

If they are informed they might worry that our bodies aren't evolved to deal with the genes that comes from non food sources. That the ramifications of weed resistance might also affect our bio systems when ingested.

Because it is not natural, GM crops do not help the environment. Why should my money go to big corporations?

That it contains poison which could increase your chances of cancer, other diseases and deformities. (Agent Orange).

Natural logic for deciding what we consume.

History of chemical corps manufacturing agent orange bio-warfare toxins.

Scientific proof of synthetic chemicals being harmful to DNA.

Scientific proof that endocrine disruptors have adverse effects on us.
Mutated organisms with select gene manipulation are not a requirement of our diet.

Consequences on health, self-sufficiency and sustainability.
Consequences on the environment, including other plants and insects that are vital for long term sustainability.

Monopoly of food sources by multi-national companies.

Not enough is known to make an educated choice.

Unknowns, created quickly with not a lot of data on effects from long-term production and use.

It's going to affect our children and their children. We have enough ODD, ADHD and OCD in the community, our system won't handle the problems that will be associated with GMO products in the future.

Because it is not natural and they dont know what repercussions we will suffer in the long run. Yes thru science we are living longer, but we are also dying of horrible deceases due to diet and lifestyle.

NO GMO FOR ME OR MY FAMILY.

Keep frankenstein business for the greedy politicians and businessmen.

1 unknown long-term effects on the human body and on the environment. 2 disapproval of meddling with natural order. 3 lack of knowledge of pros and cons.

Not wanting to have food that has been chemically tampered with. Disturbing the natural order.

We have no idea of the outcomes once we start trying to be God.

Uncertainty of safety for health.

Unnecessary modification of nature.

I think it is the educated who realise it is not good and who don't wish to put it into their bodies/make themselves ill from it. It is not the way nature intended...and you don't mess with mother nature!

What do you think are the potential environmental impacts of genetically modified crops?

Unplanned & unforeseen outcomes.

Its not a natural process.

Crops becoming weeds and being resistant to weed control chemicals.

Death of bees, lack of diversity in nature and the control of what we eat. The destruction of freedom for farmers to plant what they want and the effect on our health as a result of consuming these products.

We are being lied to on SO many levels, and Monsanto (Monsatan) have a huge agenda for control and manipulation. I want REAL food, not toxic frankenfurter food! LEAVE OUR FOOD ALONE!

Monoculture.

I wont have my own local seed

It is really an unknown factor. Scientific conjecture can only predict so far within defined and known parameters but this doesn't take into account that there are factors that we will not be able to predict until they occur.

Contamination of neighbouring farms, native forest. Unknown consequences of gm escapees to broader plant and animal life.

We will lose nature.

Continued focus on low-diversity, high-yield crops which require significant nutrient & biocide inputs which have detrimental effects on soil & water biodiversity.

Major disruption of biological relationships between plants and animals.

Ill health.

More harm to the environment caused from unbalance & new diseases.

Monoculture.

Apart from what Monsanto and other major multinational conglomerates are already doing like modifying the genetic code of the soybean to produce insecticide like qualities, the ability to change the genetic make up of organic soy beans from cross pollination and also the fact that the seed stock is a one grow stock and cannot produce any heritage seeds for seed saving and later sowing, also the fact that the genetic insecticide implanted into the soybean isn't working anymore as the insects they were using it for have developed resistances to it. It's all about control and $$$$$, Changing the genetic code of anything will have serious ramifications we won't know about for years to come, not only that who knows what they will put in or "change" in our food to "change" us ??.

Turning the soil into a dessert. Leaking to soil outside its allocated boundaries. The end of pollination.

Food security is the big issue here.

Media: depends on the journo.

This survey: Many of the questions asked would strongly depend on the situation. It was difficult to answer either way, so I answered many qtns as neither agree or disagree. Which could also be "can`t choose".

Its great somebody is looking into this. Be interesting to see if more artsy people are apposed than the orderly types. It feels a tad biased towards pushing for this outcome. Is UTAS School of Ag gm foods?
Loss of biodiversity and soil health.

Gene pools.

Crossing over to other species (contamination).
Disrupting the natural order of things.

Destruction of the food chain.

I really don't know. My concern is more to do with the control large companies want and how this will effect ordinary citizens but particularly 3rd world countries.

A lot of GM foods are destroying pollinating insects! If we have no pollinators we will not have any food. Americans are much sicker than they were years ago, taking into account that over 80% of their food is genetically modified, I am not surprised. I think nobody has looked at the impact of urine produced by

people consuming GM food on the environment. It is however also proven that cattle who feed on GM corn become sick and infertile.

Loss of biodiversity.

Damage to insects, especially bees.

Destruction of the food chain.

Putting food production in the hands of the likes of Monsanto will ensure the environment suffers at every level, to the point at which the only survivors will be the GM industry. Sorry, not well worded, but these companies will destroy everything that nature has to offer !!!

Reducing the natural diversity.

Not sure.

Pesticide resistance.

Cross breeding with non gm crops.

Unexpected behaviour of gm crop in wild such as invasive/weed behaviour.

1. The contamination of organic food supplies. 2. The contamination of wild flora. 3. The damage done to the life cycle of insects leading to decreased diversity amongst all forms of wild life. 4. The damage done to bees. 5. The loss of diversity amongst flora thanks to losing our pollinators. 6. The creation of bugs that are super resistant to pesticides.

Contamination of neighbouring crops.
The impact it's had on the bee population.

Mutation of super weeds .

Damaging effects on plants, insects, bees, soil, increased consumption of valuable water.

Contamination of non GM produce and subsequent impact on food chain.

Over farming due to more 'food' crops becoming cost effective fuel crops (combined with population growth and limit on productive land).

Similar unknowns to other 'scientific' interventions such as rabbit virus, cane toads, etc. good idea at the time, human brain incapable of knowing ramifications.

Yes definitely as the Steve Marsh case proves that GMOs don't stop at a fence boundary.

Loss of bio diversity, loss of soil quality, excessive use of fertilisers and pesticides.

Seriously, it's not JUST about the GM crop, it's about the chemicals also used to control weeds & 'pests'. Windy days are NOT my friend. Heat is definitely not my friend.

The lawsuits that are currently in progress re seed drift. The control of seed and the making food crop seed infertile forcing people to always buy and prevent farmers / others from making their own genetic crossing . The making a crop genetically weed resistant but might make it fatally flawed to other unseen pests. That inserted genes from other species / phyla might cause unseen catastrophic consequences.

Other crops and wild plants may become contaminated with the foreign genes added to the GM crop.

New 'super-weeds' may evolve which will be difficult or even impossible to eradicate.

Pollution arising from the use of harmful chemicals may increase or decrease.

Wildlife may be harmed by new toxins in the environment or changes in agricultural practices.

It'll kill the bees as they are dieing from the chemical Agent Orange. If there are no bees then there are no plants, no animals and no humans.

The chemicals used have show to be highly mutagenic in very low doses for aquatic based life forms, causing them to have trans-sexual organs, and other mutations.

The same has been seen with humans in recent decades as GMO use has increased.

Impact on bee population - vital for smaller non GM crop producers.

Impact on other plants, insect, aquatic and land animal species - all part of the "natural form of things" which should be left as is.... the earth was created as a sustainable living miracle - why mess with such intricate beauty and productivity?

Moving to other crops with the outcome being unknown.

Escape into the environment creating super weeds, excessive homogeneity of food crops.

Everything will be impacted. Europe has taken a stand and we should be very wary of Monsanto and their cronies.

Well just look at what Monsanto's "Roundup" has done the the environment and also their non seeding crops - control the food you control the masses :(.

Introduction of unwanted/foreign genes into environment, development of genetically changed insects/bugs/pests to cope with crop changes.

Again disturbing the natural order and balance which can only harm the environment and lead to potentially harmful consequences for our bodies and our world.

Disturbing the natural eco balance.

Risk of contaminating organic crops.

Endangering certain wild species survival .

Unstoppable uncontrollable spread of gmos into nature.

Animal and human health risks inc infertility...

Disaster!!! It will eventually affect all crops by cross-contamination. I remember feeling aghast when AUST introduced the first test GM crops in the late 80's. Again, you should not mess with nature. If you change one thing the pattern will be it alters everything in the chain.